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EDITORIAL.

WE PUBLISH the circular prepared by one of the committees of the Institution of Mining and Metallurgy; it deals with the standardization of the terms employed in describing screens and the work done by the use of them. The Institution is making a praiseworthy effort to introduce some system into technical terminology. This effort ought to be productive of results; it is certainly high time that the language of technical practice should be clarified from the haze of inaccurate wording which obscures so much, otherwise useful, literature.

THE ARTICLE on 'Gold in Santo Domingo' is timely, for the island has won political prominence of late. Mr. F. Lynwood Garrison gives all the data available, and while he does not make himself responsible for any positive statements as to profitable mining, he holds out the inducement for intelligent exploration.

THE MINES DEPARTMENT of Western Australia has adopted the sensible plan of reporting the gold production in fine ounces. This is the only rational and definite standard and should be adopted everywhere. In too many places it is the custom to report as gold bullion of varying and uncertain value, making it a difficult matter to get at the real production. Gold should have a fixed meaning everywhere and without change.

THE LABOR TROUBLES in Alabama are having one result, which their fomenters, probably, did not anticipate. The coal mines in that State, as first opened, were chiefly dependent upon hand labor in all their operations; partly because they were comparatively easy to work, and partly because labor was generally abundant, and consequently low-priced. Now, however, the large companies are acting on the changed conditions, resulting from higher wages and the disturbances resulting from strikes. The Tennessee Coal, Iron & Railroad Company has put in mechanical haulage plants at two of its larger mines, and is putting in others. Other appliances for saving labor are being installed, and there will probably be a great increase in the use of machinery in the course of the next year or two. The use of coal-cutting machines has been discouraged by the refusal of the unions to accede to a proper differential between

pick and machine mining. With the large mines generally working on the 'open-shop' plan, there will be nothing to hinder the introduction of such machines, and much in its favor.

THE CHANGES IN the methods of preparing and marketing anthracite coal are clearly brought out in several suits recently tried in the Pennsylvania courts. These have been brought under old leases, to determine the extent to which lessees are liable for the payment of royalty on the smaller sizes of coal, which were not saved, or marketed, when the leases were made. The facts brought out show such differences between the sizing now in use, and that which formerly prevailed, that it is difficult to find a satisfactory basis of adjustment. The court decisions are rather conflicting, and it looks as if new precedents must be made to secure substantial justice.

THE ARTICLE on compulsory arbitration in New South Wales may not appear to bear directly on mining and metallurgy, but the industries dependent upon these arts are affected by labor legislation to an extent worthy of some emphasis. Mr. F. Danvers Power states that the arbitration act of New South Wales is having an injurious effect on mining in that State, and we can well believe that the invention of new technical processes is barely able to compensate in Australia, as elsewhere, for the hindrance and cost due to ill-regulated efforts of the labor propagandists. A large portion of Australia's coal trade has been lost by reason of labor troubles, and Japan has gained thereby. In New Zealand a similar arbitration act has tended to increase the cost of living unduly. An industrial millennium is not to be secured by hurried legislation.

THE ADVICE given to the students of the Massachusetts Institute of Technology, in anticipation of their summer work in the mining camps of the West, ought to be valuable to many grown men also; therefore we publish it in full from the little pamphlet in which it reached us. Two omissions are worthy of note. No mention is made of mountain fever, a sluggish form of typhoid, prevalent at high altitudes. Care in drinking water is the only precaution. As regards pneumonia, to which the 'tenderfoot' is particularly liable, it is safe to say that immediate removal to a lower altitude is the best treatment. These remarks should not suggest that the mining regions of the West are unhealthy; quite otherwise. To men who lead a sane and clean life they afford the stimulating vitality that is born of pure air and the antiseptic fragrance of the pine; where these are not available, and the glory of mountain and forest yields to the iron severity of the desert, even there the wide air-spaces and the dry heat of the sunlit plain will conserve health and give to the men of the city that vigor which springs from nature undefiled.

THE SMELTING of iron ore by electricity is to have a practical working test in Canada. The Dominion government has appropriated $15,000 for the purposes of the test, and a building and free power will be furnished for a limited period at the Sault Ste. Marie works. The test will be under the special charge of M. Hérault, the French engineer, who has a wide reputation for his operations and experiments in electrical smelting in France. It is understood also that some experiments will be made with nickel ores from Sudbury. Should the experiments result successfully, the Canadian government will probably spend a larger sum in erecting a plant at some point in the vicinity of the iron ranges of western Ontario.

THE MODE OF occurrence of platinum is still a mooted question. The di-arsenide, sperrylite, was discovered as recently as 1889 in heavy concentrate of gold ore from Sudbury, Ontario, and has also been identified at the Rambler mine in Wyoming. Kemp recognizes the vein-concentration type of platinum deposit and also the form of dissemination in massive rock, usually basic eruptive. Whether the latter clearly comprises a case of magmatic deposit is not yet established. The mode of transportation of platinum is not at all clear; but C. W. Dickson (in the *Journal* of the Canadian Mining Institute) mentions a case of migration of platinum in solution; it is that of a limestone bed or lens in an ancient gneiss in Sumatra. The alteration of limestone to garnet and wollastonite was followed by hot mineralizing solutions carrying gold, copper and platinum. There are many possibilities; such as the formation of temporary sulpho-salts (platinum occurs in sub-division B of group 2 in ordinary qualitative analysis); the solubility of the sulphide in solution of hydrogen sulphide, or copper sulphide; or, in fact, the solvent action of steam under pressure. Fortunately the subject promises to attract students in an effort to unravel the theoretical relations into practical results.

THE PAPER of Mr. Harold V. Pearce, abstracted on another page, on 'Slag Treatment,' describes one of those simple improvements which are born of necessity. An interesting phase of the metallurgical side is the use of clean pyrite as a slag-scrubber and concentrator of the entrained precious metals. The availability of our fundamental reagents shows a persistent vitality that is remarkable. Percy worked out many of these reactions long ago; and it is as encouraging as it is interesting to find the requisite chemical at hand, ready to achieve the old economic trick of making one hand wash the other. Moreover, the 'auxiliary furnace,' in its essential features, seems to be only another ingenious application of that saving principle, which has been otherwise used in the forehearth and the settling pot, and for the recovery of that residual fraction which writes a balance in the profit column. Regarding the efficiency of the 'clean pyrite,' we hazard the observation that this historic matte-maker has a fascinating, and only half-told, story of what it can do—and has done.

WORKING COSTS on the Rand have not been decreased since the war. In 1898, the average working cost of 36 companies was 23s. 10d. per ton; in 1904, the returns from 55 mines gave an average of 24s. per ton. Expectations of a decreased expenditure of five or six shillings per ton, as estimated by several authorities whom it is not necessary to name, have failed of fulfilment. This failure to attain the anticipated economy of operation is due to the deficient labor supply, preventing production to the full capacity of the enlarged equipment; since the Chinese have been introduced, the extra expenditure, due largely to the charge for importation and re-patriation, has not balanced the benefit due to a larger supply of labor as compared to the pre-war days when Kaffirs were more plentiful. The British officials insist upon a better feeding and housing of the natives, and exercise a control unknown under the Boer regime. Explosives have decreased in cost, and there has been a slight reduction in railroad rates. Wages paid to white men are a trifle higher, but general efficiency

is said to be less than it was in 1898. The encouraging factor to offset the disappointment as regards working cost, is the higher extraction of gold from the ore in consequence of improvements in metallurgical treatment.

Mine Reports.

The 'Notes on Mine Reports,' which appeared in our last issue, may awaken expression of diverse opinions. Mr. Chester F. Lee has many sensible things to say; one of these we venture to emphasize. It is true that "a man who is honest will make statements in a form that cannot be misunderstood." The spirit of science does demand straight thinking and the direct expression of ideas; the application of science to mining asks for the same rectitude of mind. Equivocation, ambiguity and indirection of any sort in a mine report are unscientific even when unintentional; but when deliberately adopted, they are unprofessional. We have no patience with a report written in such manner that, whether the mine either does half as well or yields twice as much as the engineer vaguely predicts, it can yet be interpreted as a vindication of correct judgment. Such work is mere hocus-pocus, which evades responsibility and plays the fool with the client or company that has paid for the report; it is dishonest, in that it is a failure to 'deliver the goods,' in this case an opinion that cannot be misunderstood. We have seen the development of this tendency among engineers more careful of their reputation than of their duty. It is a bad practice; an engineer who receives $5,000 for his examination and report is paid ten times as much as the man whose fee is $500, and for the simple reason that he has a well-earned reputation which he puts to risk every time he truthfully expresses his judgment or gives his appraisal of a mine. The physical exertion, the mental exercise, the time consumed are much the same in both cases; in fact, the junior—or the man with the lesser reputation—is apt to expend more muscle, nerve tissue and time than he of the big fees; the valid reason for paying the one ten times more than the other is that the former has already won a reputation which he imperils each time his judgment is put to the test. If he plays round the subject, gives conclusions in magniloquent but ambiguous phrases, shifts his responsibility to subordinates, or in any way refuses to fulfil his bargain—the opinion which faces the facts and accepts the responsibility for an experienced judgment—he is dishonest. The statement quoted from Mr. Lee is prefaced with the clause "a man who knows his business"; and this proviso (interpreted in a sense Mr. Lee does not intend) anticipates the reply of those who adopt the methods just criticised; they will say that they know their business well enough to 'get out from under' when any responsibility overhangs them; they deem it clever to get large fees for the *simulacra* of opinions, and they consider it worldly-wise to "take care of their reputations" by avoiding statements for which they can be brought to book. But such an interpretation of conduct is foreign to the right spirit of the engineering profession; it is not even sound business; it is the attitude of a tricky tradesman.

The Interval Between Levels.

The proper distance between levels is a practical point that is often presented to the judgment of mine managers. Those who avoid the fatigue of thinking, plan their main drifts 100 feet apart, because a century is a neat number and it represents an interval which is honored by usage, if by nothing else. However, there are others who are not the slaves to empiricism of this unintelligent kind. In South Africa, it has been found that economy, without loss of efficiency, is gained by increasing the distance between levels. Before the war, 150 feet was the interval generally adopted; since then, this has been doubled in certain instances, such as the Roodepoort United mine, and there is now talk of attaining a maximum of 600 feet, measured on the dip of the lode. A saving in mining cost of from one shilling to three shillings per ton is anticipated.

The distance necessary between working levels depends, in the first instance, upon the character of a lode. On the Rand, the beds of 'banket' are fairly regular in their behavior and in their gold content; therefore, frequent drifts are not needed for exploratory purposes; the ground between any two levels, that are 300 feet apart, can be assumed to possess average characteristics to an extent impossible in most of the variable veins which represent the ore deposits of other regions. Levels 60 feet apart are common in mines based upon thin veins of rich gold-bearing quartz, subject to eccentricity of dip and the sudden changes due to short ore-shoots. The ratio between the cost of driving a drift in rich ore and the value of the output to be obtained from the stopes overhead, constitute a problem quite different from that of large levels in a low-grade mine. Although, before the eventual exhaustion of a mine, it may be necessary to drive intermediate drifts, it is obvious that, for exploratory purposes in a fairly uniform lode of low grade, it is not necessary to make these longitudinal cuts near together. The money spent in extending such levels remains unproductive until stoping begins; and, in big mines, not only is capital thus expended unprofitably, but the maintenance of drifts not in use represents a constant charge which it is advisable to avoid. At the Calumet & Hecla, levels were placed 100 feet apart, as measured on the dip of the lode, or about 65 feet in vertical interval. In this case the drift did not even fulfil an exploratory purpose, because it included only a fraction of the total width of ore. The Tamarack benefited by the error of its big neighbor, and the levels were run every 180 feet, measured vertically, giving 300 feet along the lode. Afterward, sub-levels were extended at intervals of 100 feet. At the Burra Burra mine, of the Tennessee Copper Company, the main levels are 300 feet apart, but the lode is crosscut at each 100 feet of sinking; and, when actual extraction begins, sub-levels are extended from the crosscuts. These initial crosscuts and the less frequent main levels are adequate for exploratory purposes; for stoping, the sub-levels are needed in order to afford points of attack and to facilitate transport. In a mine, the output of which goes to a smelter, it is undesirable to drop the ore down chutes of excessive height, because a powdery product hinders the working of the furnace. When the ore is destined for a stamp-mill, this disintegration is not injurious; on the contrary, it performs part of the work of the crushing machinery.

Drainage is another factor. In wet ground, it is expedient to run the new level at such an interval below the working drift that the block last opened up will become drained while the upper one is being stoped. Excessive water hinders mining and adds to all the costs of operation; by adjusting the lifts between levels, the pumping can be limited and the drainage of the lode can be regulated. In mines where the loose ground of a fault either coincides with, or crosses, the lode, it will be found that the water-level

follows the main shaft as sinking progresses. Faults also affect the problem in hand because, when a lode is subject to such dislocations, it becomes necessary to drift at short vertical intervals in order to determine the position of the vein or of the ore-shoot. A lift of several hundred feet is impracticable under such conditions, because a displacement of the lode might change the whole plan of development and render such a level inoperative. In mines of this kind (and most metal lodes are liable to such eccentricities of behavior) the function of a drift is exploratory first, and operative afterward; it serves the purpose of testing the vein and of finding the ore-shoot before it is turned into an underground artery for the transport of material to the shaft.

Anthracite Conditions.

For several years past the anthracite coal trade has been entirely harmonious, so far as its general control is concerned. The conclusion of several important transfers had brought about a "community of interest" and a unity of ownership, such as had never before been known in the trade. The comparatively small outside interests remaining were in such a position that they found it best for them to make no effort to dispute with the ruling power. Recently, however, a new element has been introduced, which has made no trouble as yet, but which appears to have caused an uneasy feeling among the leaders; quite possibly out of proportion to its real weight.

When the New York, New Haven & Hartford company acquired control of the New York, Ontario & Western, some months ago, we commented on its reasons for the purchase; but a brief recapitulation may not be out of place. They were, probably, a desire to secure traffic for its newly purchased Poughkeepsie Bridge line; to obtain a longer haul on coal than it now gets from the Sound ports; and to acquire the same control over its coal business that it now has over the ordinary freight traffic. The New Haven has always aimed at exclusive power in its territory. At a number of important points the coal supply is obtained—and probably will be obtained—by water; and this cannot be avoided. There is a large part of Connecticut and Massachusetts where the railroad is limited to the short haul from the ports on Long Island Sound and Narragansett Bay; and this condition could not be changed unless the company had a supply of anthracite of its own to offer. The Ontario & Western was the only important coal mining and carrying road which could be purchased; and even its sale was, apparently, quite unexpected by the other interests concerned.

Whatever influence this change will have on the trade cannot be immediate. The connecting railroad lines and the Poughkeepsie Bridge need extensive improvement before they can carry the heavy equipment necessary for the economical handling of coal traffic. The New Haven has the money, but the time needed to do the work cannot well be shortened. The anthracite companies look ahead, however; and, as we have intimated, there seems to be an uneasy feeling that any newcomer is an interloper, whose designs must be thwarted, lest it become dangerous. Thus, the coal controlled by the Ontario & Western being probably insufficient for the New England supply, there was a movement to add the property of the Lehigh Coal & Navigation Company. This was suddenly and quietly stopped, in a way that has never been publicly explained. Beyond that, nothing has been really done; the condition of the trade is a "state of mind," rather than any positive action.

We do not believe that this "state of mind" is justified. The New Haven is hardly likely to do anything to disturb the trade seriously. The most that it can, or will, do is to compete with some of the companies now selling coal in New England territory; and there are ways in which it can make such competition effective without any cutting of prices, or anything which would disturb the general anthracite trade.

Market Conditions.

June 14.

The metal markets show little change from last week. Copper is quiet, and consumers appear to be still holding back, so far as future buying is concerned. Probably the effect of this attitude on the market is the chief object. Tin is quiet, with buying only for immediate consumption. Lead shows no change. Spelter is, if anything, a little firmer.

Silver shows little change in price. A light demand from India has been partly compensated by some buying for China. This week's holidays in London have tended to keep the market quiet.

The iron markets remain dull. Light buying, and the persistent waiting attitude of consumers have had their effect in a lower range of prices, especially for pig iron. The monthly furnace reports show a recession from the high point of activity reached in March and April. Nevertheless, the trade is in sound condition.

In the West, the coal markets are still feeling the consequences of over-supply, and prices at consuming centers are weak and irregular. The Lake trade has shown only slight improvement. In the East, the bituminous trade has settled down to the regular summer quiet. The anthracite trade is in much the same condition.

Metallics.

Culled from all sources. Our readers are invited to assist this department by sending similar material.

Metallic barium, one of the latest possibilities of commercial electrolytic products, is of a gray color, somewhat like lead, and melts at 850° C. Its field of usefulness has not yet been fully defined.

The largest electric motor in the world is probably that constructed for the Shawinigan Water & Power Company of Canada. It is of the synchronous type and develops 8,000 h.p. The generator connected with it, at 300 rev. per min. furnishes 5,750 horsepower.

Probably the largest water-turbine ever constructed is the first consignment (of four) for the Ontario Power Company, of Niagara Falls. It is of the inward-flow double Francis type, uses over 700 cu. ft. of water per second, and, with a head of 175 ft., makes 187 rev. per min., developing over 11,000 horsepower.

As the result of recent tests, it appears that good portland-cement concrete may be used even in salt water. One essential point is that the layers should be rammed close together, as leakage will find out the cracks and subject the cement to a certain corrosive action. The results apply particularly to large masses of cement concrete.

Zinc oxide, now used enormously in the manufacture of white paint, has been usually made by the combined distillation and combustion of zinc. A new electrolytic method oxidizes the metal directly at the anode, carbon being the cathode and water the electrolyte. It is said that shavings and scrap can be used for the anodes, as well as cast metal. *L'Echo des Mines et de la Métallurgie* states that the electrolyte is pure water, which must be a slip of the pen unless some peculiar high-tension current is employed.

DISCUSSION.

Readers are invited to use this department for the discussion of questions arising in technical practice or suggested by articles appearing in the columns of THE ENGINEERING AND MINING JOURNAL.

CHEMISTRY OF ORE DEPOSITS.

The Editor:

Sir—In your issue for May 25, 1905, I note an interesting paper by Mr. Thomas T. Read on 'Platinum and Palladium in Certain Copper Ores,' in which he outlines the succession of minerals at the Rambler mine as follows: (1) Chalcopyrite, (2) covellite and chalcocite, and (3) pyrite. Mr. Read, rather apologetically, gives some equations which, he observes, "are hypothetical, since the behavior of such dilute solutions cannot be determined in terms of thermo-chemistry." I am now an old man, but I can assure this clever young enthusiast that he need not flourish the grandiloquent term thermo-chemistry in our faces, in lieu of some plain qualitative reactions; for, if we could know only the *qualitative* truth of his first equation, for instance, we would be in possession of much more information than we now possess. The equation in question reads:

$$Cu\ Fe\ S_2 + Cu\ SO_4 = 2Cu\ S + Fe\ SO_4;$$

or, introducing the good old valence marks to help one to 'keep tally' on the mutual oxidation and reduction:

Chalcopyrite Cupric Sulphate

$$Cu^{I}Fe^{III}S^{II}_2 + Cu^{II}S^{VI}O^{II}_4 =$$

Covellite Ferrous Sulphate

$$2Cu^{II}S^{II} + Fe^{II}S^{VI}O^{II}_4.$$

This reaction evidently deals with matters of some complexity. There are two kinds of copper (cuprous and cupric) on the left-hand side of the equation and only one kind (cupric) on the right. That means that half the copper has been oxidized from monad cuprous, to dyad cupric, copper. This, in turn, means that something has been reduced, and the hypothetical change of ferric to ferrous iron (as indicated) *could* explain the formation of covellite. Now this, if proved, would be an interesting matter, perhaps first pointed out by the German mineralogist Groth (many years ago in his 'Tabellarische Ubersicht'); that is, that in common chalcopyrite, the copper is the base and the iron is the nucleus of a sulpho-ferrous acid ($H^{I}Fe^{III}S^{II}_2$). (Although this contains ferric acid, this would have to be called *ferrous* acid to distinguish it from real *ferric* acid, a higher oxidation product.) If we could have the qualitative truth of this reaction proved, it would greatly enhance the theory of ore deposits, on account of the obvious abundance of the minerals in question.

I noticed a reference to this same sulpho-ferrous acid some months ago in a rather ambitious set of papers on copper, in your JOURNAL.

All these allusions to theory are good and helpful; but some of us are busy men; and, once in a while, it would rest our old eyes mightily to know that some possible explanations have been brought within the range of proved fact. We will not ask for a thermo-chemical experiment immediately (it will come in time), giving the heat formation to a fraction of a calorie; but I do believe that a simple qualitative test might be tried relative to the value of the theorem that (in the presence of cupric sulphate) the supposed ferric iron in chalcopyrite may oxidize its own cuprous copper to cupric copper of part of the covellite. Is it asking too much to call the attention of Mr. Read, and others, to the desirability of proving this reaction, both for their own reputation and the forwarding of the study of ore deposits? AGRICOLA.

Philadelphia, June 5, 1905.

PRECIPITATION OF CYANIDE SOLUTIONS.

The Editor:

Sir—The criticism of Mr. Bridger, in your issue of May 18, upon my paper on this subject—or rather upon an abstract of that paper—is evidently partly based on the misapprehension that it was intended to favor some other method than the use of zinc-shaving. Direct comparison was drawn only between the three systems that have obtained a high degree of practical importance—the zinc-shaving, zinc-dust and electrolytic—and an endeavor was made to compare such reliable data as were available. More space was given to the zinc-dust process, since, in spite of several descriptions which have been published,* it seems to be the least understood of the three systems mentioned. Even Mr. Bridger appears to have been under the impression that it is necessary to lose time "while the solution is assayed and the proper amount of zinc-fume needed to precipitate a given amount of ore calculated," whereas no such calculation is needed in ordinary practice, because the quantity of precious metal to be precipitated is not the only factor, nor the governing factor, in proportioning the amount of zinc to be used.

Even when a reasonably large excess of zinc-dust is used in order "to be on the safe side," there is no very large "needless consumption of zinc," and the difficulties of refining are not necessarily increased, since the composition of the precipitate does not materially differ from that of the zinc-shaving product, as is evident from an inspection of the table at the head of page 754 (in the issue of April 20), showing the weight of gold and silver precipitated per pound of zinc consumed. The results given in this table, it may be added, were not obtained in laboratory experiments, but in the regular work of a number of large and successful plants, and each represents an experience ranging from a month to over a year. A comparison of these figures shows that there is nearly as much variation in the results obtained at different plants using the same process, as between the results of the two different methods of zinc precipitation; that is, the variation not only in the ratio of gold to silver in the solutions successfully precipitated, and of these metals to the zinc consumed, but also in the percentage of zinc dissolved, and therefore in the undissolved zinc remaining to contaminate the product and affect the refining process.

As to the question of efficiency of precipitation, there are other localities where workers, who would object to being considered 'ignorant or careless,' have failed to duplicate the fortunate experience of El Oro district, where Mr. Bridger states that the barren solution from zinc-boxes is kept to the low average of 3 cents per ton. To quote Julian and Smart's recent book, dealing with South African practice: "Good and bad precipitation is largely a matter of opinion. Thus, in one work where the sump solutions rarely exceed 1 dwt. ($1) the precipitation is regarded as efficient, whereas at another 10 grains (40 cents) is considered the maximum for efficient precipitation. There are some who reduce their solutions to 1 or 2 grains (4 to 8 cents), but this is often a doubtful economy." It was long ago pointed out, by Alfred James, that the precipitation of silver-gold solutions by zinc-shaving was usually much more complete than when the gold was largely in excess of the silver. This holds good equally with the zinc-dust method, although Mr. Bridger "regards it as impracticable" with Mexican silver-bearing ores, while admitting that it will work well "with a gold-bearing ore when the pay ore is soluble." As a matter of fact, no extreme difficulty has been met in the use of large presses, nor in precipitating with them 1,000 to 1,500 tons daily, of solutions containing silver in proportions ranging from one-hundredth part up to 10 parts of silver for each part of gold.

The question raised as to the size and number of filter-presses required for handling 1,500 tons of solution per day, is worth considering. Taking the moderate estimate of 6 tons hourly precipitated per 100 sq. ft. of cloth area, we have 144 tons per day. To allow for possible delays and contingencies an even lower capacity may be assumed, say, only 125 tons per 100 sq. ft. per 24 hours. At this rate 1,500 tons daily would require 1,200 sq. ft. of filtering surface; say, 4 presses of 300 sq. ft. each, or 3 presses of 400 sq. ft. effective surface—an equipment which under ordinary conditions could precipitate over 1,700 tons daily. Presses of both these sizes are today in successful opera-

*See Merrill, *Trans.* A. I. M. E., 1904, Vol. XXXIV, pp. 594 and 984; Magenau, this JOURNAL, Aug. 11 and 18, 1904; Jackling, *Min. & Sci. Press*, June 2, 1900; Warren, this JOURNAL, Dec. 30, 1899. A modern electrolytic plant is described by Hamilton, *Journal* of the Chem. and Met. Soc. of S. Africa, Nov., 1903, *Electrochem. Industry*, April, 1904.

tion with zinc-dust in the United States, without any excessive consumption of time, care or labor. In one instance, it was for some reason thought preferable to instal ten smaller presses; at this plant as much as 2,500 tons of solution have been precipitated in 24 hours.

Whether zinc-dust, or any other precipitant, can compete with zinc-shaving in economically precipitating the extremely low values recorded by Mr. Bridger, from such an unfavorable medium as creek water containing only 0.01% KCN, is certainly very doubtful.

W. J. SHARWOOD.

Berkeley, Cal., June 4, 1905.

CHINESE ON THE RAND.

The Editor:

Sir—The new constitution that has been formulated and promulgated for the Transvaal is a measure which seems to be based on national principles of constructive government. Without going into details, it may be stated that the new constitution provides for a bicameral chamber, the lower house consisting of 39 members, to be elected on a suffrage based on a property qualification, while an appointed upper chamber is composed of members nominated by the governor and his council. Given a fair trial, it would probably bring peace and prosperity to the distracted country, and evolve political, social and commercial order out of the chaotic and warring interests that are so seriously, if not ruinously, detrimental to mining industry on the Rand. That the constitution provided to supersede the Boer political institutions will ultimately be accepted by those who become citizens of the Crown colony, whose destiny was ruled by the late President Kruger so unhappily for himself and his countrymen, seems to be in accordance with the historical development of British colonial experience. The Transvaal is in a period of radical transition. The future of the goldfields on the Rand is at stake. It is the one country in the world where the prosperity of mining property is dependent upon the issue of partisan politics.

There is no question that the Liberal party will triumph in Great Britain at the general election, which cannot in the nature of the case be a long way off. As far as political prognostications are of any value, it may be assumed that not only will the Liberal party sweep the country, but that its composition will be decisively, if not overwhelmingly, Radical. A Liberal majority, predominantly progressive in its program of reform, will be pledged implicitly and explicitly to expunge from the journals of the House of Commons the resolution that permitted the introduction of Chinese coolie labor into the Rand goldfields. The question is, can even a Liberal ministry withstand the clamor that will be raised to revoke the license granted to the mine-owners to import and employ Chinese labor in the Transvaal under any circumstances? We believe they will be powerless to do so, even if they be willing. The more outspoken and intransigent of the labor leaders in England are already anticipating the time when the Chinese will be driven out of South Africa, bag and baggage. The number of labor candidates aspiring for seats at the general election is larger than ever before sought parliamentary representation. Not only that, but they stipulate that at least one or more of their number must enter the Cabinet. The labor leaders who are seeking a seat in Parliament are not of the stamp of Broadhurst, Wilson, McDonald and Burt, who were not merely miners and practical working men, leaders in trades-unionism, but politicians whose enlightened and conservative principles made their voice and their vote actually and accurately representative of the labor interests that sent them to the House of Commons. The new recruits for parliamentary honors have individually and collectively placed in the forefront of their program of reforms that they are determined to insist upon the expulsion of the Chinese from the mines, no matter what the ultimate consequence may be.

There are at present in and around Johannesburg about 3,000 Chinese coolies. These men are kept in compounds. They seem to be content with their lot, although one or two minor outbreaks have been reported. The number at present in the mines is about sufficient for the purposes for which they were introduced, and there appears to be no disposition on the part of the mine-owners to employ more. As a matter of fact, the white labor in the Rand mines exceeds the coolies eight to one. But the whites do not want to see them there at all. The outcry against the Chinese is not nearly so clamorous in Johannesburg, where the facts are known and the economic conditions under which they work are appreciated, as it is in England by the socialist labor agitators, who denounce their presence there as slavery. In the Transvaal it is well understood, of course, that the only labor that the Chinese have supplanted or supplemented is not that of the whites of British or foreign birth, but the Kaffirs, who—now that the fear of the Boers is removed—will not work in the mines at all under any reasonable inducement, and who do very little outside of them, as long as they can pick up as much as will keep them from dying of starvation. If the Kaffirs worked as they worked even before the war, the mine-owners would probably not have pleaded for the introduction of the Chinese; well aware, as they must have been, of the intense antagonism that such a step would arouse in England. But the Kaffirs would not work, or worked only to earn as much as would carry them over protracted sprees, or spells of inborn idleness. Being British citizens with all the political rights that British citizenship implies, except that of voting, these spoilt children—not merely of their own nature, but of the missionary and aborigines protection societies—became as useless as only they could become when permitted the full latitude of their improvidence and dislike of work.

One thing seems to be certain—the Rand mines cannot be successfully operated under present conditions without the Chinese labor. Neither the white man nor the black man will voluntarily, at any rate of wages, take up the rough work that the Chinese are doing, if not entirely satisfactorily, at least reasonably well. If the Chinese are forced to go, the first who will suffer, and suffer longer than they anticipate, are the men who are now clamoring most loudly on the Rand for their expulsion. Even gold mines may be worked at a loss when the labor agitator insists upon operating them on altruistic ideals and under economic fallacies.

ENGINEER.

Scranton, Pa., June 4, 1905.

ARITHMETIC ARGUMENTS.*

The Editor:

Sir—Referring further to the metric discussion that has been appearing in this JOURNAL, I would add, in continuation of my remarks printed on p. 1054 of the issue for June 1, 1905:

4. I have not seen Garnier's book, but I have seen at least two other French arithmetic books and one German one, and in all of them compound arithmetic was nearly absent. Garnier, according to Mr. Dale, gives 22 pages to *'nombres complexes'*; but I notice that the book, judging from its title, is an advanced one; also that the *'nombres complexes'* are near the end; also (judging from other books I have seen) I suspect a good many of these *'nombres complexes'* are British measures. Our adherence to needless complexities compels our neighbors to take occasional dips in them, too.

5. Mr. Dale says the study of weights and measures in schools is merely superficial memorizing; the real knowledge is acquired only by using them. True, but this latter knowledge is as easily gained with metric measures as with any others. My children, age 6 and 8, can guess lengths in centimeters about as well as I can. And Mr. Dale omits the third and most relevant point. One must learn (1) tables, (2) the concrete units, (3) computation. And it is No. 3 that takes the British child 350 hours and the metric child almost none.

6. Another letter of Mr. Dale's appears in the same issue. In it he maintains that since German textile measures are still chaotic, the many eye-witnesses who say the adoption of the metric system caused no difficulty in Germany must have been all wrong. Probably most people can see that this is a *non sequitur*. Mr. Dale

would not find fault with the statement that the hundredweight is familiarly used in England; yet I could easily disprove it by Mr. Dale's kind of argument. Lead ore in the Pennine hills is still weighed in bings; the metric quintal and the 100-lb. cental have each a *clientèle,* and nearly everyone who has studied weights and measures regards the hundredweight as a nuisance. As for Germany, I can say from personal experience that as early as 1887 a man could spend a week there, question everyone he met about weights and measures, and yet never meet a non-metric measure. The textile trades are isolated, and are still held in economic subjection by Manchester, and Manchester is held in subjection by *vis inertiae* and Mr. Dale.

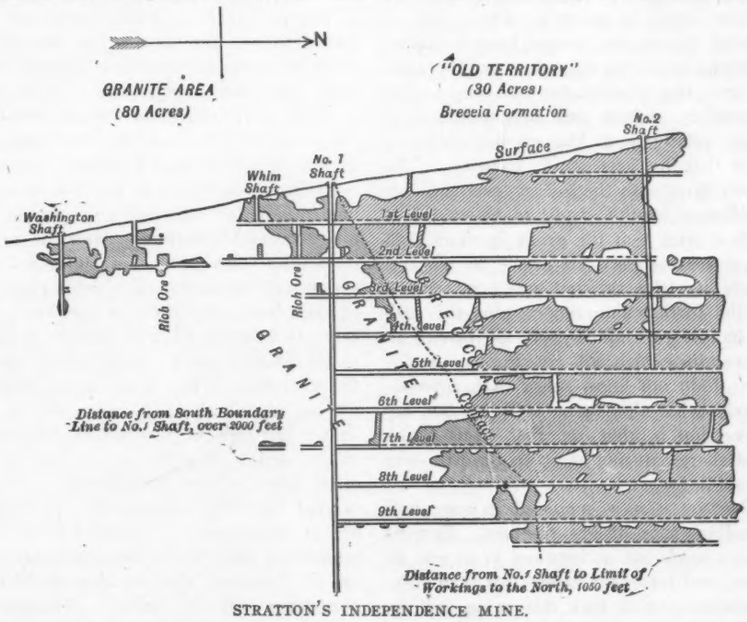
7. As to the questions of troy weights raised by Mr. Dewey, that gentleman says it takes 23 metric weights to weigh 151,278.6 grams, and only 16 troy weights to weigh the equivalent 4,863.72 oz. But (1) his largest metric weight is 10 kilograms, and I think 15 of these would be easier to handle than 9 500-oz. weights (500 oz. = 15½ kg.), unless the United States Mint is staffed by Samsons. This accounts for 6-7 of the difference between 16 and 23. (2) The metric measurement goes down to 0.1 gram, and is therefore three times as accurate as the troy one, which goes down only to 0.01 oz., or 0.3 gram.

CALDWELL HARPUR.

Nenthead, Cumberland, England, May 25, 1905.

Lessees and Ore Discovery.

The accompanying longitudinal section on the Independence vein at Cripple Creek is taken from a circular issued by Stratton's Independence, Ltd., the company operating this mine. It is interesting because it exhibits the occurrence of ore in both the breccia and the granite, as the vein penetrates from one formation into the other. The bulk of the ore appears to be near the contact of the two rocks referred to, and to the north of it, in the breccia. According to the company's circular, "the largest tonnage and best grade of ore," produced recently by the Independence mine, has come "from the granite area south of the main shaft, and occurred in a split off the main vein." In this connection it is interesting to quote a paragraph appearing in the report of T. A. Rickard, published in March, 1899. It was stated by him that "the Washington claim is all in granite. It was the scene of Mr. Stratton's earliest mining, and carries a long ore-shoot of two-ounce stuff. In this direction there is room for successful development, the Strong and Gold Coin mines, both in the granite, and in the immediate neighborhood, having discovered very large and valuable orebodies south of the contact." Recent discoveries in the Washington ground, as in other parts of this famous mine, are due to the activity and skill of lessees. The company's circular states that "compared with the results and reports published for the last financial year, the change wrought under the leasing system, inaugurated in August, 1904, is remarkable." Remarkable it is to those whose mining is done at long range and who do not appreciate that, while the instinct to find ore may be inborn, it is best cultivated by going underground and by that daily observation which is nô part of the experience of absentee engineers. In this case the lessees disregarded (so says the circular) the expressed opinions of eminent engineers; and, if they have proved the latter to be wrong, it is not because working miners know more about finding ore than experienced mining engineers; but simply because no education is so valuable in deciphering the obscurities of vein structure as that obtained by daily contact with facts. This is the lesson of the lessees at Stratton's Independence; we do not think that their recent discoveries indicate the uncovering of large orebodies in the granite; to give assurance of this desirable consummation, more evidence is needed than is as yet available.



STRATTON'S INDEPENDENCE MINE.

Carbon monoxide in the atmosphere may be easily determined by leading a small volume over silver oxide, or into a solution of the same in ammonium hydroxide, the carbon being oxidized to the di-oxide and the silver being reduced to the metal. As carbon monoxide is without odor and actively poisonous even in small quantities, it cannot be confused with hydrogen sulphide or acetylene, either of which interferes with the reaction on silver oxide, but which fortunately can be detected by their odor. The precipitated silver can be estimated by the darkening, which is compared with standard solutions. This ingenious help in atmospheric analysis is described in a recent paper by Henri Dejust.

American Gold Mines.*

BY J. H. CURLE.

The rise of nearly £3 a share which has lately taken place in Alaska Treadwell, does not seem to be warranted. The company lately sold its part in the Tacoma smelter, which stood at a nominal price in the balance-sheet, for over £200,000, and will realize a profit of about £1 per share on this deal. But that asset is now disposed of; the increased dividends that will be paid in returning this to the shareholders are in the nature of a bonus, and are only temporary. Deducting this bonus, the shares may be said to stand at a price which they are not really worth. The mine is doing as well as ever, but it is not safe to discount the future in the way now being done. It seems likely that the length of pay ore will continue to get less at each level, and it appears to me that the total tonnage of ore now left in the mine is, in a sense, limited. The shareholder is not to jump to the conclusion that Alaska Treadwell will be worked out next year, or in ten years for that matter; but he might take note of the following figures. The mine is now capitalized (deducting the bonus) at, say, £1,300,000. It takes, roughly, six tons of ore to earn £1 profit; so that 7,800,000 tons of ore must be treated to pay back the present capital. If to this be added due allowance for interest, it will be seen that at least 11,000,000 tons of ore are required to justify the present price. The present ore reserves are over 4,000,000 tons, but probably 25% of this will be required for pillars, and cannot be used. Of course, the company is in a strong financial position, and no doubt before the present mine comes to an end will be able to acquire one or other of the big low-grade deposits of the Silver Bow basin; but, for

* From *The Economist*, London, June 3, 1905.

all that, the shares are now too high; the dividend they will pay at the price will not be enough to allow of both interest on investment and repayment of capital.

Cripple Creek, as a field, is now showing signs of wear and tear, and there is fairly good evidence that most of the mines have begun to get poor in depth. As to Stratton's Independence—a mine which has existed from hand to mouth, so to speak, for the last two years—my information is that it is now very near its end. I think it is not possible for the mine to last long enough to pay back its present capitalization.

The Camp Bird has done all I expected of it, and today, after three years' existence as an English-owned mine, has got more profit in sight than when it was bought. The weak point is the lowest level, where, so far as I know, the values have not been up to the average. In a property of such size, and in a mine where values occur in patches, rather than in defined shoots, one cannot hazard definite opinions about the existence, or otherwise, of ore; the shareholder can only secure himself by making sure that the profit in sight, relatively to the market value, is such that he gets good security. The Camp Bird, with the lowest level showing indifferent results, ought to be valued at such a price that the profit in sight shall be at least 80%. To arrive at what it really is, take the net profit as shown by the forthcoming report, plus the cash in hand, and minus 25% of profits to the vendor, which will give the correct figure. I do not know other than approximately what this figure will be, but my impression is, that on that basis Camp Bird shares are not at present worth over 30 shillings.

Tomboy is now supposed to have half a million tons of ore reserves. Current profits work out at between $1.50 and $2 a ton, and represent rather less than 10%. I always expect that this mine will be able to increase its mill to 100 stamps, for there is evidence of a very big amount of ore in the mine, and with 100 stamps the profits would be a good deal increased.

El Oro field, in Mexico, is for us the most interesting mining locality in America just at present, and the Esperanza the most interesting mine. When floated, 18 months ago, Esperanza was estimated to be able to earn, with its 120 stamps, £100,000 a year on its capital of £455,000; it had, indeed, been earning this for its local owners. But things unexpectedly went wrong. Exchange went up, wet seasons rendered the supply of wood fuel dearer, and of poorer quality. Worse than either of these was a serious creep in the mine, damaging one of the shafts, and entailing a lot of repairs and extra timbering. On the top of these the ore in the lowest level, as had been the case in the adjoining El Oro, got poorer. These unforeseen events caused the grade to come down slightly, and the expenses to rise considerably. Between the two the profit suffered to the extent of probably 5s. a ton, and the estimated surplus of £8,000 a month became in actuality barely £5,000. At this juncture two parallel reefs were discovered of sulphide ore, strangely enough, although the main lode at the same depth is oxidized; these are very rich in places. The evidence so far is, I think, that these new lodes are not permanent factors, and it will not be safe to assume the existence of this new ore over other than a local area. But the ore, where good, is unusually good. A ridiculously small quantity of this, blocked out, has been figured as showing a net profit of $800,000, or just doubling the net profit in sight in the mine, and there seems little doubt but that during the next two years very substantial profits will be earned. As to the future of Esperanza, beyond two or three years, I feel uncertain. The main lode will have to improve again in depth before one can feel satisfied, and as for the new lodes, there is as yet not sufficient evidence that they cover any large area. Esperanza, as well as El Oro, will in a month or two be benefited a good deal by being able to buy water-generated electric power.

El Oro is still poor in the lowest workings. This fact outweighs at present the many favorable features about the mine: its million tons of ore in sight, its 200-stamp mill, its improved cyanide plant, its chances from other lodes within the property, its valuable railway, and its holding in the Mexico mine. In all of the assets the shareholder has fairly good security for his capital invested, and a rise in the shares can only be justified by improving values, either in depth or on one of the other lodes where development is being carried on. The discoveries of sulphide ore in Esperanza, as narrated above, are hopeful as regards El Oro, although this ore in Esperanza was not close to El Oro boundary. On the whole, although at present the actual facts are unfavorable, the chances are in favor of values again being met with somewhere or other on El Oro property.

The basalt mounds of the Columbia lava in the eastern part of the State of Washington are noted by C. V. Piper (in a current issue of *Science*) as a phenomenon, to the origin of which no clue has hitherto been given. Their usual height is from 2 to 4 ft. and their diameter from 10 to 20 ft.; in fact, their general shape resembles that of an upturned saucer. In the old bed of the river near Winona, they are intermediate in a series which shows every degree of weathering, "from rock-caps to mounds of basaltic boulders; and from these to ordinary basaltic soil. The conclusion seems unavoidable, therefore, that these mounds are the result of decaying basalt caps from which flowing water had previously worn the softer surrounding rock."

Books Reviewed.

The United States Geological Survey. Water-Supply and Irrigation Paper No. 117. The Lignite of North Dakota and its Relation to Irrigation. By F. A. Wilder. Washington; Government Printing Office. Pages 54; illustrated.

This is a brief but valuable description of the coal of North Dakota, and especially in relation to its use as a source of power in pumping water, which frequently lies near the surface. The pamphlet is provided with sketch maps, halftones and a good index.

American Society for Testing Materials. Report of Committee on Standard Specifications for Cement. Chicago, Ill.; issued by the Cement Department of the Illinois Steel Company. Pages, 17; illustrated.

This convenient cloth-bound pamphlet is the official report of a committee which includes the names of thirty or more of the most prominent professors, engineers, and other authorities on cement. The value of the report, in this form, is none the less that it is issued by an industrial corporation.

The Copper Mines of Lake Superior. By T. A. Rickard. New York and London; The Engineering and Mining Journal. Pages, 164; with illustrations. Price, $1.

It is said that Alexander bemoaned the harshness of Fate, in that he, unlike Achilles, was not provided with a Homer to sing his mighty deeds. Extending this not ill-sorted metaphor, the Lake Superior region certainly has no cause for complaint in her possession of a complement of historians who have portrayed all sides of one of the most unique mineral regions of the globe. Hall, Pumpelly, Irving, Wadsworth, Whitney, each has given his side of the great topic; but among them all, this series of pen pictures, by the departing Editor of this Journal, comes in as a refreshing summary of the essentials in the geology, mining and practice of the home of native copper. Rarely is it given to a pencil to touch dead facts with such life as we find in these pages. The very individual mines stand out as prominent characters in the local history, clear in the relief of their experience, and touched with all the color of an intelligent and sympathetic pen. We cannot imagine an engineer too tired to read these chapters, yet we know of no other authority which has so much of reliable fact, so invitingly served. Moreover, the writer, in a kindly way, has brushed aside some of our too romantic notions, such as that regarding the Bagdad tales of mass copper too big for economic treatment. The mineral supply of the region described is vast; its reduction is fascinating in its magnitude and perfection; but above all the personality of the men who wrought

the work stands out predominant. This little book bears neither the tiresome detail of the exhaustive monograph, nor the careless irresponsibility of the casual reporter. But, from the introduction to the fifteenth chapter (and the last), one reads this book with a satisfactory feeling that it is informed, unbiased, and timely, a permanent picture of a region that is still second only to Butte in copper output, and preserved in a frame that is a testimony to the combined ability of one who is a writer—and an engineer. P. S. C.

Der Betrieb der Steinkohlenbergwerke. Second Edition. By Ch. Demanet. Edited by Dr. Kohlmann and H. Grahn. Braunschweig, Germany; Friedrich Vieweg & Sohn. Pages, 825; illustrated.

This monumental treatise on coal-mining practice is not a work to be approached lightly. The old treatise of Demanet, *'Traité d'Exploitation des Mines d'Houille,'* was translated into German twenty years ago by C. Leybold; and this second edition (of the original French into German) is here revised and edited by two noted coal-experts. The book as a whole is to be compared in scope and detail with such authorities as the well-known English manual of Herbert W. Hughes. It is a serious matter to revise the whole material given in this large work, but some knowledge may be gained of the thoroughness of treatment by the following outlines: Beginning with a general analysis of the geological structure of coalfields in general (80 pages), and continuing with a description of the gases found in the coal mines, the classification of coals, the book goes on to consider chiefly the Belgian, north French (English), Westphalian and Polish coalfields. Coming to actual practice, shaft sinking and construction, gallery work, drilling and shooting are considered (200 pages). The actual winning of coal, ventilation, etc., follow (300 pages). Stoping, hauling, hoisting, disposing of water are next considered (160 pages). The handling and the administration of mines and men follow, the legal requirements of Belgium and France completing the volume.

It is a matter of some interest to note that there is hardly a footnote or reference to related literature in the book, and, most singular of all, there is no index of any kind, neither for subject matter, nor for names of places or persons. But, all the same, the book is one in the limited class of original authority as regards European practice; and while much of the method so carefully described is distinctly continental (and, perhaps, unsuited for American practice), yet, as a whole, the book should be familiar to all who are engaged in coal mining.

The slag from certain blast-furnaces, when pulverized and mixed with an excess of lime, forms the so-called slag cement, a good variety of hydraulic cement.

Books Received.

In sending books for notices, will publishers, for their own sake and that of book buyers, give the retail price? These notices do not supersede review in a subsequent issue of this JOURNAL.

Versuche mit Verschiedenen Pumpensystemen. By Professor Baum. Berlin, Germany; Julius Springer. Pages, 116; illustrated.

Hungarian Statistical Annual. 1903. Prepared in the Ministry of Commerce. Budapest, Hungary; published for the Ministry. Pages, 488.

New South Wales. Records of the Geological Survey. Volume VIII, Part I. Sydney, N. S. Wales; Government Printer. Pages, 68; illustrated.

Lavori di Ricerca e di Preparazione e Sestemi di Cottivazione. Prepared and published for the Associazione Mineraria Sarda. Pages, 44; illustrated.

Relazione di un Viaggio in Sardegna, Compiuto nel 1829. By Francisco Mameli. Iglesias, Italy; published by the Associazione Mineraria Sarda. Pages, 156.

Statistiques des Industries Extractives et Métallurgiques en Belgique. 1903. Prepared in the Ministry of Industry and Labor. Brussels, Belgium; L. Narcisse. Pages, 52.

Transactions of the American Foundrymen's Association. 1905. Dr. Richard Moldenke, Secretary. New York; published by the Association. Pages, 64; illustrated.

New South Wales. Annual Report of the Department of Mines. 1904. E. F. Pittman, Under-Secretary for Mines. Sydney, N. S. W.; Government Printer. Pages, 164; illustrated.

Ueber die Einrichtung zur Entstaubung der Braun Kohlen Brikettfabriken. By L. Seemann. Freiberg, Germany; Kraz & Gerlach. Pages, 24; illustrated. Price (in New York), 35 cents.

The Cullinan Diamond. By F. H. Hatch and G. S. Corsterphine. Johannesburg, Transvaal; reprinted from *Transactions* of the Geological Society of South Africa. Pamphlet, 4 pages and 2 plates.

Special Consular Reports. Volume XXXV. Warehouses in Foreign Countries. Prepared by the Bureau of Statistics, Department of Commerce and Labor. Washington; Government Printing Office. Pages, 204.

United States Geological Survey. Production of Asbestos. 1904. By Joseph Hyde Pratt. Pages, 24. *Production of Barytes,* 1904. By Joseph Hyde Pratt. Pages, 12. *Production of Lithium Minerals,* 1904. By Joseph Hyde Pratt. Pages, 8. *The Fluorspar Deposits of Southern Illinois.* By H. Foster Bain. Pages, 76; illustrated. Washington; Government Printing Office.

American Society of Mechanical Engineers.

SPECIAL CORRESPONDENCE.

The fifty-first annual meeting of the American Society of Mechanical Engineers opened its proceedings at Scranton in one of the halls of the building of the Young Men's Christian Association on Tuesday night, June 6. Seventeen years ago the conference held its proceedings in this city. At that time it had a membership of 700; today it has an enrollment of 2,900 members. Professor Hutton, of Columbia University, called attention to the fact that when the association last visited Scranton, that city manufactured more steel rails than any other in the country. Today it manufactures none, the Lackawanna Iron & Steel Company having removed its plant to Buffalo, where, on the shores of Lake Erie, it has, within the last few years, built up one of the largest steel plants, devoted to the manufacture of rails, in the world.

Although Scranton has only one iron and steel manufacturing plant of consequence, the Allis-Chalmers works, as the center of the anthracite industry it has much of interest to be investigated by the visiting engineers.

The Laurel Line, which extends and is open from Wilkesbarre to Dunmore, some 20 miles in length, and which will in a short time extend to Carbondale, is an electrical and purely civil engineering enterprise. The visitors were greatly impressed by the territory it covered, the picturesque country through which it passes in many places, and the guarantee it affords of the potential applicability of electricity to long-distance haulage. The track is double, and is ballasted with stone throughout. All the bridges are of stone, and there is one tunnel a little outside of Scranton which, although not yet finished, has taken almost two years in boring.

The engineers who visited Scranton 17 years before this and inspected the mines at that time and compared the mechanical contrivances in use then with those installed recently by the Lackawanna, for instance, in the majority of its mines, could not fail to take professional pride in the strides that have been made in their equipment during the interval. Electricity has largely superseded the antiquated devices, both inside and outside, of the mines. Some obsolete appurtenances that have not yet disappeared are rapidly going out of favor and out of existence. Happily for the mine boy and his future material and moral welfare, the automatic slate-picker is taking the place of the youth who sorted the 'boney' from the marketable coal at the mouth of the chutes. The mule has not yet disappeared, but it is rapidly vanishing, and no one will miss it. While all mines are not yet equipped with motors, it is only a matter of a very short time when they will be brought into universal use.

The breakers that have been built in recent years, or that have replaced the old ones, are far superior in design and mechanical appliances to those which they have replaced. The amount of coal that they are capable of turning out is far greater, the work is done more economically and expeditiously, and the product is in some respects, if not in all, superior. Seventeen years ago no one realized that the unsightly culm dumps contained sources of great wealth. The question then was how best to get rid of them. Some advocated that they should be flushed back into the mines, as the mines became worked out.

About 400 members of the association were expected to be present at the meeting, and the greater number attended, many of whom were accompanied by their wives. Almost every State in the Union was represented. The opening session was held at 8.30 on Tuesday night. The visitors were welcomed by William F. Mattes, chairman of the local committee, Colonel F. Hitchcock in behalf of the Board of Trade, and E. M. Zehnder, president of the Scranton Engineer's Club.

President John R. Freeman, in response to the address of welcome, said that 17 years ago their meeting was presided over by the same chairman, and they had the same reception committee. He reminded them that at that time they were invited to witness the success of the first electrical railroad in the United States, which, as they all knew, was opened in Scranton. It was interesting at this time to review the crudeness of the ideas upon electricity that were held at that comparatively recent date. There was an important matter relative to the test made at that time in Scranton. Contemporaneous plans were being made for the cable road in Boston. When the promoters heard of the success of the electrical road in Scranton, they sent their engineers to investigate. Upon their return to Boston the surveying corps for the proposed cable road was abandoned and an electrical road was planned, being the beginning of the great system of electrical roads in Boston. Mr. Freeman referred in complimentary terms to the International Correspondence Schools of Scranton. In one shop in Providence there are 200 men, he said, students of that institution. In conclusion the speaker said: "I am proud of Scranton, because it was the home of a dear friend and apprentice of Mr. Mattes, Major Louis Seymour. His work in South Africa carried the fame of the American engineer into that country. . . . In him the society lost one of its most promising members, and I shall always think more of Scranton because it was the home of my friend Louis Seymour."

After the address papers were read as follows: 'Standard Unit of Refrigeration,' F. E. Matthews, New York; 'Formation of Anchor Ice and Precise Temperature Measurements,' Dr. Howard G. Barnes, McGill University; 'The Transfer of Heat at High Temperature,' Frank C. Wagner, Terre Haute, Ind.; 'Some Types of Centrifugal Pumps,' W. O. Webber, Boston.

On Wednesday the ladies of the party were taken around Lake Scranton, the great reservoir that supplies Scranton with water, through silk mills and other places of interest.

On Thursday the members of the association visited the immense car-shop that the Lackawanna railroad has built at the Keyser valley, where a few years ago there was only a wilderness of scrub brush. The equipment, mechanical and otherwise, is all absolutely new. Not a pound of old material has been utilized in the construction or equipment of the works. The following facts will give an idea of the size of the shops: Total cost, $1,250,000; number of large buildings, 9; area covered by buildings, 6 acres; concrete flooring, 5 acres; earth excavated, 350,000 tons; men to be employed, 2,500. When originally designed, it was estimated that the shops would cost in the neighborhood of $500,000. The company did not by any means contemplate erecting such large buildings, with the costly finish that characterizes them. From time to time the plans were improved, so that the sum of nearly a million and a half will no more than cover the total cost. The buildings are made up as follows: Two repair shops, each 140 by 400 ft.; paint shop, 60 by 400 feet; planing mill, 90 by 400 ft.; machine shop, 80 by 300 ft.; blacksmith shop, 80 by 180 ft.; office and storage, 44 by 105 ft. The building of the plant was carried out under the supervision of Superintendent W. B. Hixson, of the bridge and building department, and Division Engineer George J. Ray. The plant is in charge of Superintendent of Motive Power Kilpatrick, assisted by Master Car Builder Robert F. McKenna and Master Painter B. E. Miller.

At the morning session, President John R. Freeman in the chair, professional papers were read as follows: 'Microstructure and Frictional Characteristics in Bearing Metals,' Melvin Price, of Lincoln, Neb.; 'Cast-Iron: Crushing Loads and Microstructure,' Wm. J. Keep, of Detroit, Mich.; 'Smoke and Its Abatement,' Chas. H. Benjamin, of Cleveland, Ohio. The latter paper appeared to be the most popular of the session, as an instructive discussion followed. Mr. Benjamin pointed out that the supply of smokeless fuel was limited in quantity and would not be sufficient to meet the demand. The supply of bituminous coal was practically unlimited, and its cheapness and the readiness with which it burns, even with a poor draft, rendered it the most desirable. He afterward dealt with the best means of preventing large volumes of smoke with the use of bituminous coal.

It was decided that the next summer meeting be held at Chattanooga, Tenn. The tellers reported that the membership of this society, with the new members, now reached 2,930. An invitation was read from the Pacific Coast Congress of Engineers to attend the Portland, Ore., Exposition on June 29, 30 and July 1, when the society will hold its annual meeting.

The evening session was largely attended, and much interest was displayed in the discussions. The papers read were as follows: 'Can a Steam Turbine be Started in an Emergency Quicker than a Reciprocating Engine of the Same Power?' A. S. Mann; 'Notes on Efficiency of Steam-Generating Apparatus,' A. Bement; 'Performance of a Superheater,' A. Bement; 'Counterweights for Large Engines,' D. S. Jacobus; 'Steam-Actuated Valve Gear,' William H. Collier.

On Thursday, the fifty-first session of the American Society of Mechanical Engineers came to a close. In the morning, while the members were transacting business, the ladies were taken for an automobile ride around Lake Scranton. In the evening they were entertained at a reception at the Scranton Bicycle club-house by the Scranton Engineers' Club and the Board of Trade. On Friday, the members were entertained at Wilkes-Barre, being taken over the Laurel Line in a special train furnished by the company.

At the morning session, on Thursday, professional papers were read as follows: 'Note on Heads of Machine Screws,' H. G. Reist, of Schenectady, N. Y.; 'Belt Creep,' William W. Bird, Worcester, Mass.; 'Function of Laboratory Courses in the Curriculum of Engineering Schools,' Chas. E. Lucke, of New York City, discussed by A. Bement, of Chicago, and Hugo Diemer, of Indianapolis. E. N. Trump read a paper on 'Continuous Measuring and Mixing Machines.'

Admiral George W. Melville was unable to be present, and his paper on 'Epochs in Marine Engineering' was read by Secretary Hutton and discussed by John T. Hawkins, of Boston, and A. Bement, of Chicago.

The making of continuous link-chains by alternate stamping and bending of one four-ribbed bar of steel is a practical novelty of recent steel practice.

In the Huntington-Heberlein process, galena is mixed with quicklime, the whole raised to a temperature of 700° C. (1,300° F.) and air is blown in, whereby the lead sulphide is changed to the oxide and is fused by the heat of the reaction. In the similar Carmichael-Bradford process, the lead sulphide is mixed with calcined gypsum, and the blowing-in of air is performed at a somewhat lower temperature (900° C.), the result being practically identical with that of the Huntington-Heberlein process, though the intermediate reactions, of course, may be slightly different.

Questions and Answers.

Queries should relate to matters within our special province, such as mining, metallurgy, chemistry, geology, etc. Preference will be given to topics which seem to be of interest to others beside the inquirer. We cannot give professional advice, which should be obtained from a consulting expert, nor can we give advice about mining companies or mining stock. Brief replies to questions will be welcomed from correspondents. While names will not be published, all inquirers must send their names and addresses. Preference will, of course, always be given to questions submitted by subscribers.

Electric Installation in Canada.—I have heard of a large electric installation at a mine in eastern Canada, but cannot locate it. Can you give me any information about this matter?—E. C.

Answer.—You probably refer to the plant put in by the Eustis Mining Company last year, at its copper mines near Sherbrooke, in Quebec. This plant is briefly described in the last report of J. Obalski, Inspector of Mines of the Province, as follows:

"The Eustis company has completed important installations for using electric power. The power was obtained by building a dam 15 ft. high across a rapid in the Coaticooke river, whence the water is brought by a wooden flume of 7 ft. diam. to a standpipe 36 ft. high, whence it is distributed to two pairs of turbines of 18 in. by a steel pipe of 7 ft. diam., giving 450 h.p. with a height of 32 ft. The power-house is 340 ft. from the dam, and place has been left for a third pair of turbines. The turbine shaft is directly connected to a 200-kw. Westinghouse three-phase, 2,200-volt rotary field generator. The exciter is operated by a separate 9-in. turbine. The power is conveyed to the mine, two miles away, by three drawn-copper wires, and it supplies the air-compressor, the hoisting engine and the concentrating works. The new machinery was put in by the Jenckes Machine Company, Ltd., of Sherbrooke, but the old steam machinery was retained for use in case of the electric power failing through accident. The compressor is driven by a 100-h.p. Westinghouse 2,200-volt, constant-speed induction motor. The motor for the hoist is a Westinghouse 150-h.p., three-phase, 2,200-volt, variable-speed induction motor, with a normal speed of 480 rev. per min. The controller is mounted on the engineer's platform, and has seven steps; it acts by connecting different resistances, in series, with the rotating part of the motor. The crushing and concentration plant is driven by a 50-h.p., 200-volt, slow-speed Westinghouse induction motor, supplied through two 25-kw. transformers.

"The distribution of compressed air and the concentration have not affected the mine itself, while the hoisting by means of the new power has had a great effect on it. The hoisting is now done by means of a single shaft having a slope varying between 20 and 45°, and a length of about 2,000 ft. There are two tracks 4 ft. wide, with steel rails of 56 lb. The speed of ascent is 500 ft. per minute, representing in all 5 to 6 minutes for the ascending and descending of a car containing 5 tons of ore, the total weight to be raised by the machinery being 7 to 8 tons. The carload is dumped automatically into a bin, from which the cars are filled that are hauled out through the tunnel by horses. Under the old system it took about 30 minutes for a car to ascend with its load and descend empty, while several men were required for the work.

"The company will thus be in a position to greatly increase its output, and a great improvement has been effected as regards the comfort of the workmen who are conveyed up and down the shaft by the machinery. The hoisting is effected by means of two cast-iron drums of 48 in. by 72 in diameter, mounted on independent shafts. These drums are driven by the electric motor by means of friction clutches and are controlled by friction brakes worked by hand, or by compressed air by the engineer. The motor has a capacity of 150 h.p., giving the wheels a speed of 480 rev. per min. Signals are given by lights, by bells and by telephone, with an indicator showing the position of the cars in the shaft. This electric installation is the first applied to mines in the province of Quebec, and must be noted as marking the introduction of a new system of mining. On account of the work necessitated by this alteration in the plant, the output of the mine has been less than in previous years, but the company intends to develop it considerably by increasing the hoisting capacity of the mine and by at once concentrating the low-grade ore. The company likewise proposes to erect special concentration works to utilize a couple of thousand of tons of old débris that have been accumulating for many years."

Recent Legal Decisions.

SPECIALLY REPORTED.

USE OF SURFACE BY OWNER OF MINERALS.—In answer to some questions on this point, we quote the following from Lindley's 'American Law Relating to Mines and Mineral Lands,' section 813, new edition: "A grant of minerals implies the right to win them from the underlying soil. The use of some portion of the surface is necessary for the proper enjoyment of this right. To reach the minerals the miner must pass from the surface downward. To do this he has a right of way of necessity. He may sink through such land from the surface to the mines, in order to reach and work them. This way of necessity ought not be of larger dimension than is reasonably requisite. This right, however, cannot be extended to the use of other lands belonging to the grantee, for the purpose of transporting ore; nor can it be asserted for any purpose not legitimately associated with the search for and extraction of the minerals. And it would seem that this right of surface user is not restricted by reason of the fact that the surface owner had granted a right of way for a tunnel, by means of which the ore could be removed from the mine.

"Where the instrument by which the title to the minerals is severed from that of the superjacent soil does not define the extent to which the grantee of the minerals may use the surface, he has a right to use so much of such surface as is strictly necessary and reasonable. He cannot claim as an incident that which is simply convenient; he can only have, as to the surface, that which is necessary, but that which is necessary he may have in a convenient way. This involves the right to use such means and processes, for the purpose of mining and removing the minerals, as may be reasonably necessary in the light of modern invention and of the improvements in the arts and sciences. It includes the necessary ground for machinery for working the mine and stowing the ore in its first marketable state, but not for the erection of smelting works, or accessories, for the purpose of treating the product, such as converting coal into coke or clay into brick. What improvements are reasonably necessary for the profitable and beneficial working of the mines is a question of fact to be determined from the evidence in each particular case.

"Where it is necessary to artificially store water as an adjunct to mining operations, a limited quantity of the surface may be devoted to that purpose. So a right of ingress and egress over the surface, to and from the necessary mine openings, for the purpose of transporting supplies, machinery and the product of the mine, would be a way of necessity; but the exercise of this right must be in the course least prejudicial to the owner of the surface.

"The acquisition and enjoyment of surface easements and rights of way for mining purposes other than those of necessity are the subject of private contract. . . .

"The owner of a mine beneath the surface, though he have a right of way through the surface soil, has no right so to exercise the same as to interfere with the power of the owner of the land to make any lawful use thereof. He is bound to erect proper guards around his mine openings, so as to prevent them from being a source of danger to the cattle of the surface owner. He is not liable for any incidental damage necessarily occasioned by the ordinary and careful operation of his mine. The loss of springs to the owner of the surface by reason of the ordinary working of the mines does not render the owner of the minerals liable for damages. A mine-owner is not responsible to the surface owner for disturbances caused by necessary blasting in the mine; but this necessarily implies that the blast must not be discharged in an improper or negligent manner. As here-

tofore noted, the miner is authorized to use such means and processes for the purpose of mining and removing the minerals as may be reasonably necessary in the light of modern invention and of the improvements in the arts and sciences."

Abstracts of Official Reports.

Clitter's United Mines, Ltd.

This company owns four of the tin mines at Gunnislake, Cornwall, but mines ore in only two of them, treating simultaneously the dumps from old operations. The third mine is being unwatered and explored, and the fourth is abandoned. The mill is well equipped with rolls, ball mills, Buss tables and Frue vanners, and the losses of mineral, both tin and wolfram, average 4 lb. per ton of ore. The recovery during the year ending Nov. 30, 1904, averaged 20.06 lb., valued at 16s. 7d., as compared with 25.16 lb. per ton, worth 13s. 1d., during the previous year. The total recovery during the period was: Tin oxide, 109.7 tons, sold at £77 11s.; wolfram, 96.7 tons, sold at £99 7s.; copper and arsenic to a value of £619, all being obtained by the crushing of 22,906 tons of ore, only 7,757 tons of which was fresh from the mine. This brought a profit of 5s. 4d. per ton crushed. A plant for the precipitation of copper has been erected but has not been used, and to utilize the increasing proportion of arsenic in the ore, the use of the Greenhill Arsenic Works has been secured.

The profit on the year's mining work was £6,019.

Columbus & Hocking Coal & Iron Company.

This company owns a large coal property in the Hocking Valley district in southeastern Ohio. The report is for the year ending March 31, 1905. The coal mined was 291,666 tons, a decrease of 103,069 tons from the previous year. The financial statement is as follows:

Earnings	$341,997
Expenses and repairs	308,675
Net earnings	$33,322
Interest, taxes, etc.	72,822
Deficit	$39,500

The capital account shows $18,900 preferred stock; $6,981,100 common stock, and $1,000,000 in 5% mortgage bonds.

The president's report says: "In spite of the hard work performed, the net results have not proved satisfactory. We have had to overcome, not only the serious condition in which we found the affairs of the company, but prices have been on the decline, our list prices during this period averaging $1.43 for domestic lump against $2.03 during the same period the preceding year and $2.50 during the year prior to that, which was the boom year in the soft-coal district. When the soft-coal trade improves we shall be in better shape than ever before to dispose of our output to advantage. Our hopper at the new opening of our Kinkaid field will be completed in a few weeks. The upbuilding of our sales department has required temporarily increased expenses. In fact, this has been a period of reform wherefrom the benefits will be realized in the future.

"Much has been done, but more remains to be done—especially in regard to one of the company's greatest assets—our clay lands. We firmly believe that a larger revenue can be derived from the company's clay deposits than in the past from all its other resources, and that when these have been properly developed the company will be able to pay handsome dividends.

"Recognizing the necessity of acquiring new coal lands, we have been negotiating for additional properties of considerable size, some of which are adjacent to the territory in which we are now working. As soon as the right moment arrives, definite propositions will be submitted.

"The borings around New Straitsville prove conclusively that the company owns an extended field of the very best coal that is to be found in the Hocking district. At Doanville, however, the results have not been so satisfactory; a great portion of our field being too thin to work profitably for the present. Our borings in Vinton county prove that we have coal there of the famous No. 2 Jackson seam, but not in sufficient quantities to justify us in opening up this property, at least for the present."

Old Dominion Copper & Smelting Company.

The report of this Arizona company covers the year 1904. The event of greatest importance was the beginning of construction on a new smelter, owing to which productive work was suspended for six weeks, and yet the financial statement for the year shows that a substantial profit was made.

The new shaft has been sunk from the 10th, at 649 ft., to the 12th level, at 840 ft. The crosscuts from the new shaft on the 3rd, 5th, 8th and 12th levels have been completed, and a new crosscut on the 10th level for drainage and ore extraction in the west has been driven, amounting in all to 5,863 ft. of drifting and rising, or about double the work done in 1903. Since March 1 this development expense has all been charged to mining. Owing to the search for and extraction of the exceedingly rich ores throughout the ore-bearing ground for the past 20 years, serious creeping has resulted, and it was anticipated that the cost of maintaining an open passage through the old extraction drifts on the various levels would be more expensive, owing to the settling of the ground, than to open up new extraction drifts, in the foot-wall, with easier and more uniform grades, where no crushing and settling need be feared, where little timbering is required and where the cost of maintenance is light. From these extraction drifts, crosscuts will penetrate the ledge and be maintained only as long as ore is being extracted from the immediate vicinity of each crosscut. Such extraction drifts have been begun and will be driven on the 3d, 5th, 8th, 10th and 12th levels. They are or will be connected with each other by a system of raises by which some of the intermediate levels will be worked. The expense of the several miles of new drifts necessary will, of course, be heavy, but it does not cost as much to drive these new drifts as it does to open up and constantly retimber the old drifts.

The original plan for rock-house and storage bin at the new shaft has been abandoned, and a new design has been prepared with a view to allowing the heavy machinery to be placed on earth foundations, to the giving of abundant storage room both above and below the breakers, and to the permitting of hand-picking lump ore at low cost. The system comprises six 75-ton steel bins for the reception of different classes of ore, with conveying belts to carry the ore automatically through the crushers, over the picking belts and to the eight storage bins. These also are steel, with hemispherical bottoms, and are supported on steel posts at a sufficient height to allow 50-ton steel cars and locomotives to pass under them. Six of them hold 140 tons each, and the other two hold 210 tons each, but nearer to the ground and are intended to store crushed ore for the concentrator. A small sampling-mill is being built alongside the main storage bin. All custom ores will be sampled here, as well as the company's, for purpose of directing smelting operations.

The concentrator, as well as all the rest of the plant, will be designed with special reference to the automatic handling of all materials. The foundation and retaining walls are of massive concrete; the building is of steel. The mill will be of a type that has worked successfully on similar ores in the Southwest, although in general design it is modified to suit the peculiar conditions. It is of the progressive-crushing type and is provided with a roughing floor containing nine jigs and six Wilfley tables, and a finishing floor provided with nine Wilfley tables and 18 Frue vanners. The ore will be drawn from the two large storage bins above referred to by automatic feeders, and received by a belt-conveyor, which will transport it to the top of the mill, where it will be delivered into the rotating screens. The capacity of this new mill as now being built will be about 300 tons per day. By increasing the size of the finishing floor and the addition of more Wilfley tables and vanners, its capacity may be increased to about 450 tons per day, and it is so designed that if the time ever comes when a much larger concentrating capacity is desired, another

unit may be added, making a large mill of two separate units, with a maximum capacity of 450 tons per day for each, or 900 tons total capacity.

The smelter building and furnaces were erected during 1903, on a very satisfactory plan. A new design was necessary, however, for the down-takes, dust-chamber and the stack, and these accessories have been erected on a scale sufficient to accommodate smelter operations, in which the indicated free air blown into the furnaces amounts to 50,000 cubic feet per minute, and three stands of converters are used. This construction required a cross-section of the dust-chamber four times that of the original plans, and an increase in the size of the cross-section of the stack of some 50 per cent. Time did not permit of the erection of steel storage bins for ore and coke at the smelter, although steel bins would have been somewhat cheaper in initial cost. Wood ore-bins on concrete foundations, of a capacity of 2,000 tons of ore, have therefore been erected. A briquetting plant with bins for flue-dust and concentrate is about finished. The briquettes will be dumped automatically into basket cars and dried by passing through the hot dust-chamber.

Operations at the smelter have been confused by the necessity of carrying on construction and operation at the same time. It became necessary also to utilize a larger proportion of lean silicious ore, involving the smelting of a larger proportion of barren flux and the buying of ore high in sulphur in order to get an adequate matte-fall. Most of this ore was obtained from the Copper Queen Consolidated Mining Company, although some was brought from Mexico. Local ores were bought freely in addition to as much of the ore from the United Globe mines as could be consumed. The total production of fine copper was 15,368,147 lb., as against 7,479,721 lb. in 1903. The varieties of material treated in the smelter during the two years was as follows:

	1903 Tons	1904 Tons
Mine ore—first-class	37,499	47,424
Mine ore—iron	18,267	27,921
Custom ore—sulphide and matte	847	23 327
Custom ore—first-class	597	12,673
Total ore	57,210	111,345
Old slag	5,182	1,706
Limestone	4,579	19,219
Converter slag and chips		12,075
Flue-dust	4,706	931
Mine ore first-class, stock pile	1,756	
Flue-dust, stock pile	2,294	
Total charge proper	75,727	145 276
Matte re-smelted	672	7.455
Furnace cleanings		1,369
Gross charge	76 399	154,100
Fuel used in furnaces	11,487	18,792
Fuel ratio to gross charge	15.04%	12.19%

The mine ore carried an average of 7.19% copper, and the copper saved in bullion amounted to 6.41% of the ore. It was impossible to utilize the flue-dust, but it has been saved and will be briquetted and smelted during 1905. About 7,000 tons have been accumulated, averaging 7% copper. Cost of smelting during 1904 was $4.04 per ton of ore or $3.09 per ton of charge, a reduction of 37c. from 1903. During the last month of 1904 the cost was further reduced to $2.36 per ton of charge, and as the new smelter comes into full operation, greater economies may be expected. The cost of mining and transportation was $4.55, of pumping $1.30, and of development $0.95; total, $6.80 per ton delivered to smelter bins, as against $9.09 of the previous year. The cost of producing fine copper was 10.14c., and of handling, 1.05c. per lb.; total, 11.19c. per lb., deducting gold and silver values. The product was sold at 12.11c. per lb.; in the form of matte, 157,741 lb.; blister copper, 15,569,109 pounds.

The income and expense accounts may be stated briefly as follows:

Sale of copper (15,368,147 lb.)	$1,861,399
Sale of silver (86,125 oz.)	49,741
Sale of gold (1,524 oz.)	30,477
Total receipts	$1,941,617
Expenses at Globe, including purchase of custom ores, and construction	$1,638,914
Transportation, commissions, interest, taxes and Boston office expenses	161,104
Total expenses	$1,800,018
Profit for the year	$141,599

The company's capital stock amounts to $3,750,000 and other liabilities total $1,085,345. The profit and loss account shows $222,918 as surplus, while a special fund originally of $94,314 but since reduced to $8,154, has been set aside for the prosecution of impending law-suits.

Patents Relating to Mining and Metallurgy.

UNITED STATES.

The following is a list of patents relating to mining and metallurgy and kindred subjects, issued by the United States Patent Office. A copy of the specifications of any of these will be mailed by THE ENGINEERING AND MINING JOURNAL upon the receipt of 25 cents. In ordering specifications correspondents are requested to name the issue of the JOURNAL in which notice of the patent appeared.

Week ending June 6, 1905.

791,452. CHIMNEY OR STACK.—Layton E. Croe and Fred L. Miller, Kalamazoo, Mich.

791,461. GAS-PRODUCER APPARATUS.—Carleton Ellis, New York, N. Y.

791,477. CAR-DUMP.—William A. Lathrop, Wilkes-Barre, Pa.

791,478. LOADING APPARATUS.—Thomas J. Lower, North English, Iowa.

791,494. APPARATUS FOR MAGNETIC SEPARATION.—Clarence Q. Payne, Stamford, Conn., assignor to the International Separator Company.

791,515. HYDROCARBON-FURNACE.—Theodore A. Tyas, Hoboken, N. J., assignor to Gustav W. Drasel, Hoboken, N. J.

791,529. HOISTING-MACHINE OR POWER-TRANSMITTER.—Daniel Abrey, Philadelphia, Pa.

791,545. CHIMNEY.—David D. Elder, Jr., New York, N. Y., assignor of one-half to Morris W. Kellogg, Elizabeth, N. J., and W. B. Osgood Field, New York, N. Y., composing the firm of M. W. Kellogg & Co., New York, N. Y.

791,555. PROCESS OF STRIPPING TIN.—Henry W. Hemingway, Walthamstow, England.

791,566. SEPARATOR.—William V. Meyer, Chicago, Ill.

791,577. PROCESS OF SMELTING ORE.—Elfego Riveroll, Los Angeles, Cal.

791,601. ENDLESS CONVEYER.—Ralph M. Andrus, Chicago, Ill.

791,631. LUMINOUS PAINT.—Hugo Lieber, New York, N. Y.

791,660. REDUCTION-FURNACE.—Gregor Walzel, Newark, N. J., assignor to Edward Zusi, Newark, N. J.

791,665. MOLD FOR ARTIFICIAL STONE OR THE LIKE.—Samuel A. Wilson, Newburgh, N. Y.

791,675. PROCESS OF MAKING HYDROSULPHITES.—Louis Descamps, Lille, France.

791,685. APPARATUS FOR CHARGING RETORTS.—Samuel J. Fowler, Cambridge, Mass.

791,700. DREDGER-BUCKET.—John J. King, San Francisco, Cal.

791,711. CONCENTRATOR ATTACHMENT.—Frank S. Morgan, Nevada City, Cal.

791,726. APPARATUS FOR SPREADING BITUMEN OR MATERIAL OF A SIMILAR CHARACTER.—August E. Schutte, Boston, Mass., assignor to Warren Brothers Company, Boston, Mass.

791,732. APPARATUS FOR OPERATING STAMP-MILL DRIVES.—Robert Taylor, Subiaco, Western Australia, Australia.

791,799. ORE-BRIQUETTE.—William A. Koneman, Chicago, Ill.

791,812 and 791,813. OIL-BURNING APPARATUS.—Jake Palmatary, Los Angeles, Cal.

791,833. ROLLER-MILL.—Simon Snyder, Muncy, Pa., assignor to Sprout, Waldron & Co., Muncy, Pa.

791,844. FORGE.—John E. Washburn, Rockport, Mo.

791,846 and 791,847. PNEUMATIC DRILL.—James Whitelaw, St. Louis, Mo.

791,872. APPARATUS FOR CIRCULATING AND MIXING CRUSHED ORE.—Frederick C. Brown, Komata, New Zealand.

791,896. VALVE-MOTION FOR AIR-COMPRESSORS.—Fritz Gerb, New York, N. Y.

791,901. ANNEALING-BOX.—William E. Harris, Niles, Ohio.

791,916. ORE- OR COAL-CARRYING BARGE.—Thomas Kiddie, Ladysmith, Vancouver Island, Canada.

791,928. PROCESS OF TREATING FERRUGINOUS ORE FOR THE MANUFACTURE OF IRON AND STEEL THEREFROM.—Montague Moore, Melbourne, and Thomas J. Heskett, Brunswick, Victoria, Australia.

791,940. FEEDING DEVICE FOR SLABS, BILLETS, ETC.—Casimir von Philip, Bethlehem, Pa., assignor to Bethlehem Steel Company, South Bethlehem, Pa.

791,944. COKE-GRAPPLE.—William M. Pugh, Pocahontas, Va., assignor of one-half to J. T. Sanders, Pocahontas, Va.

791,956. METHOD OF MAKING WHITE LEAD.—Clinton P. Townsend, Washington, D. C.

791,958. AUTOMATIC BLAST-TEMPERATURE-REGULATING VALVE.—Samuel W. Vaughen, Lorain, Ohio, and John W. Cabot, Johnstown, Pa.

Reissue No. 12,354. BUCKET CONVEYER.—Arthur J. Frith, New York, N. Y., assignor of one-half to Trenton Iron Company. Original No. 570,251, dated Oct. 27, 1896.

GREAT BRITAIN.

The following is a list of patents published by the British Patent Office on subjects connected with mining and metallurgy:

Week ending May 27, 1905.

9,202 of 1904. SMELTING IRON.—R. M. Daelen, Dusseldorf, Germany. Smelting fine ores by briquetting mixtures of the ores and finely divided carbon, and after reduction charging them into a molten bath of iron to prevent reoxidization of the spongy iron formed.

11,707 of 1904. MINE CAGE.—H. Johnson, Dudley. In hauling up coal ore from depths, dispensing with cars, and making the mine cage into a large carrier to receive mineral in bulk.

21,661 of 1904. PRESERVING COPPER FROM CORROSION.—F. Uthemann, Dantzig, Germany. To prevent copper from sea corrosion, placing in contact with it a more electropositive metal such as iron, thus setting up an electrolytic action which not only prevents the copper from attack but covers it also with a protective coating of oxide of iron.

1,725 of 1905. BREAKING GROUND UNDER WATER.—F. Lobnitz, Renfrew. Improvements in the inventor's method of breaking up ground below water, for use especially in connection with dredging.

Special Correspondence.

San Francisco. June 7.

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"Any superintendent, director, secretary, manager, agent, or other officer, of any corporation formed or existing under the laws of this State, or transacting business in the same, and any person pretending or holding himself out as such superintendent, director, secretary, manager, agent, or other officer, who shall willfully subscribe, sign, endorse, verify, or otherwise assent to the publication, either generally or privately, to the stockholders or other persons dealing with such corporation or its stock, any untrue or willing or fraudulently exaggerated report, prospectus, account, statement of operations, values, business, profits, expenditures or prospects, or other paper or document intended to produce or give, or having a tendency in such corporation to give, a greater value or less apparent or market value than they really possess, or with the intention of defrauding any particular person or persons, or the public, or persons generally, shall be deemed guilty of a felony, and on conviction thereof, shall be punished by imprisonment, in State prison or a county jail, not exceeding two years, or by fine not exceeding five thousand dollars, or both."

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vide the requisite mixture of ores and fluxes a body of hematite is being developed on the Old Hickory group.

Deadwood. June 10.

The destruction by fire of the Horseshoe company's big cyanide plant a few days ago will not hinder the progress of operations. According to the officials of the company, it will merely delay them. The Kildonan mill of the company, at Pluma, which was abandoned at the time of the construction of the Mogul mill, which was burned, will be repaired and in operation within six weeks. It will have a capacity of 150 to 180 tons per day. At present the company is shipping ore valued at from $15,000 to $30,000 per month; high-grade smelting ore goes to Denver and Omaha and a good grade of cyaniding ore is being shipped to the Lundberg, Dorr & Wilson mill, at Terry.

The Mogul mill cost in the neighborhood of $350,000 and was insured for $251,000—enough to replace it with a good plant—one that will not be as bulky and cumbersome as the one destroyed. It was a plant of 120 stamps, equipped for wet-crushing cyanidation, and embodied the latest improvements in the practice of cyaniding. At the time of its destruction it was handling 350 to 400 tons of ore per day, and this, with the smelting ore shipped, brought the monthly production of the company to over $50,000.

The annual meeting of the company occurs in the Hills the middle of the present month, and it is rumored that a reorganization will be effected; the capital stock reduced materially. The company's capitalization is $10,000,000, and this will be halved, at least. The affairs of the company are at present in the hands of a receiver—W. L. McLaughlin, former general manager—a step taken to relieve the company of possible lawsuits on account of liens and indebtedness which might become entangling claims during the partial suspension of operations.

The Homestake company is preparing foundations to receive and erect the largest high-pressure air-compressor ever turned out of the shops for mine service. It is being built by the Ingersoll-Sergeant Drill Co., and will furnish compressed air at 1,000 lb. per square inch for 14 H. K. Porter 6 by 10 air-motors that will displace horses and mules for underground ore haulage. The big machine will be installed in the east end of the Ellison hoist, giving the Homestake the distinction of having under one roof probably the finest and most expensive equipment of mining machinery extant.

The Clover Leaf has temporarily suspended, owing to the big 1,000-gal. pump on the 700 breaking last Saturday. A cave in the stope on the 700 dammed up the water, with the result that none came to the sump for some little time, and the pump sucked air, sprang a couple of gaskets, was shut down, and when the rush of waters finally arrived was started up too fast and broke in some vital part—just what, is not known. The mine soon filled to the 600 and although two 500-gal. skips were secured from the Homestake and the most heroic work performed with them, the water gained such headway it was impossible to continue operations.

Spokane. June 9.

Judge Beatty, of the Federal court at Boise, Idaho, has refused the injunction sought by numerous farmers along the Cœur d'Alene river, in northern Idaho, to restrain the great mines of the district from dumping tailing from their mills into the stream. It was alleged that the poisonous minerals contained in the ores were polluting the waters and ruining the hay-meadows. The judge not only refuses the injunction, but scores the plaintiffs, for he says that on visiting the scene with attorneys, he found the river not choked, but "deep enough to float a battleship," and no such conditions as were alleged were found to prevail. The judge said:

"The wild assertions of complainants without justification cannot shelter themselves behind the flimsy veil that they believed them because so told. A man must have some reason for a belief before asserting its truth. It seems by some to be considered admissable practice in litigation to asert anything regardless of truth, that will constitute a non-demurrable case." Judge Beatty enters into the question of contradictory evidence in affidavits filed regarding the presence of poisonous substances in the river, as asserted by chemists on either sides, and concludes that the court would not be justified in issuing a restraining order of those affidavits.

The court adds that the granting of such an order would close the mines and depopulate the district. The case is of monumental importance to the Idaho mining industry. The direct damages that were sought by the farmers amounted to hundreds of thousands of dollars. They were directed at all the principal companies working mines and mills on the Cœur d'Alene river. The granting of judgments for damages would almost ruin some of the companies. Even more serious, however, would be the damage by stopping the mills.

The clean-up of the Post-Lambert mill in the Mount Baker (Wash.) district for six weeks with 15 stamps was $40,000.

Albert Geiser, who has taken control again of the famous Bonanza mine in Baker City (Ore.) district, expects to put 20 stamps at work at once. The Belcher Mining Co. interests, controlled by Palouse farmers and owning a big low-grade gold-copper property near Belcher (Wash.), on the Colville reservation, has succeeded in financing a subsidiary company, the Belcher Mountain Railway Co., sufficiently to start work on a seven-mile railway to connect the mine with the Kettle Valley lines. The survey is done and contracts have been let for ties.

Advices just received here from Charles Sweeny in New York announce that he will continue in the presidency of the Federal Mining & Smelting Co. On selling out his large holdings in Federal to the American Smelting & Refining Co., a few weeks ago, Mr. Sweeny announced that he would only continue as president until his successor could be chosen. It was then considered probable that Fred. W. Bradley, the head of the Bunker Hill & Sullivan — Alaska-Treadwell interests — would be his successor. Negotiations were entered into with Mr. Bradley by the Federal officials, but were not satisfactory. There is likely to be continued litigation —though on a lessening scale—between the Bunker Hill & Sullivan, and the Federal company, over rival claims at Wardner, Idaho, and it was inexpedient for Mr. Bradley to serve as the head of both corporations. It is unknown here whether Mr. Sweeny has repurchased stock in the Federal company.

Butte. June 6.

Stockholders in the Reins Copper Co. have held their annual meeting and elected an entire set of new officers for the ensuing year. J. M. Guffey, of Pittsburg, one of the large holders, succeeded J. P. Reins, of Butte, as president, but Mr. Reins was elected vice-president. The offices of secretary and treasurer, heretofore maintained separately, have been consolidated with W. F. Johnson, of Pittsburg, in charge. G. L. Thompson, of Butte, was chosen as his assistant. The new directors are Mr. Guffey, Asa P. Childs, William P. DeArmit, Henry J. Miller, F. J. Weixel, and E. W. Marland, of Pittsburg, and J. P. Reins, George W. Stapleton, W. W. McDowell, E. D. Leavitt and Guy W. Stapleton, of Butte. Of the 1,000,000 shares for which the company is incorporated, about 800,000 shares were represented. With one or two exceptions, all of the large Eastern holders were present. The work of deepening the shaft and changing it from a two-compartment to a three- from the 800-ft. station to the surface has been commenced. A larger hoisting engine and more powerful pump have been ordered.

The stockholders in the Parrot company also met today and elected John D. Ryan, of Butte, Richard D. Willard, Ed. G. Storey, A. W. Bemis, Sidney Chase, Charles D. Burrage and Charles H. Dickey directors. Of the 229,850 shares, 173,885 were represented at the meeting.

The Cable Lease company, operating west of Butte, is prospecting its ground with two diamond drills, one of which has been placed at the bottom of the 200-ft. shaft. Pittsburg capital is backing the enterprise.

Manager Rueger, of the Lexington property, is extracting copper ore from the upper levels of the Allie Brown, one of

the company's claims. It is of good quality. He is also shipping the old waste dump to the East Helena smelter, having sent out about 4,000 tons. The material in the dump averages about $6 per ton in gold and silver. It was formerly considered unprofitable. F. A. Heinze has a lease and bond on the property, but has not equipped it with machinery. The foundation for the hoisting engine was finished several months ago.

Amalgamated has maintained a steady output of ore during the week. All of its mines are in operation. The entire production is now going to its two smelters, the Washoe in Anaconda and the Boston & Montana in Great Falls. The Butte & Boston plant is completely out of commission, the last fire having been drawn a week ago.

United Copper is not operating its smelter to its full capacity at present, but is laying plans to make as much copper as formerly. During the last three months it has kept only two furnaces and one converter at work.

Bisbee. June 8.

A deal is pending at Duluth, which is the headquarters of both companies, by which the surface rights of the American Development Co. will be bought by the Warren Realty & Development Co. The price to be paid is all that American must pay for its ground, the Warren assuming all the bonds, so that American will get its mining lands practically free of expense. As these lands are supposed to be very valuable, and seem to carry the leads running through Junction ground, this deal is a big one for American. This company was organized a year ago, and has just increased its capital stock from 12,000 $10 shares to 50,000, calling enough from its stockholders to make the whole issue $1 paid in. This call has been made for June 15. American is doing nothing with its lands and will now be able to wait till developments all around it have shown its value, for the assumption of its bonds by the Warren relieves it of the necessity of proving its ground before paying up. Warren will at once lay out a town on the ground it has acquired, and it is probable that the larger part of Bisbee's population will ultimately be found at this site.

Water at Calumet & Pittsburg has decreased a trifle more and now stands at 1,900 gallons a minute. There has been a corresponding increase at Junction, whose pumps are now handling from 900 to 1,000 gallons a minute. It looks more and more as though the water problem that has troubled Pittsburg so long is practically solved.

It appears that the question of the consolidation of the various 'Bonanza circle' properties here is to be taken up with vigor and settled by the stockholders shortly as possible. Opposition that resulted from the previous attempts aroused seems to have somewhat died away and it is thought that the consolidation can be more easily arranged than at any time in the past.

A large flow of water has been struck in the vertical shaft of the Chiricahua Development Co., at Paradise, and work was temporarily stopped in the mine. But new and larger pumps have been received and the water is now going down. It is considered a good indication for the presence of large bodies of sulphide and the company is much pleased.

Mining is again in full swing at Jerome. As stated in this correspondence some time ago, the reported caves were grossly exaggerated and the damage was but temporary and slight. The workings are now being gobbed back as fast as they are mined out and all trouble with caves is expected to disappear, as this system of mining is extended to all openings of the mine. There has been a great increase to the extent of the underground fires during the caves from the added influx of air, and this is giving some cause for alarm, but the report that the mine had seen its end is too absurd for contradiction.

Toronto. June 8.

A. P. Coleman, who is at present in the Michipicoten mining district, reports to the provincial bureau of mines that Edgar Brown, of Sault Ste. Marie, is engaged in stripping an iron claim on Lake Anjigomi. The range is over a mile long and shows a good quality of magnetite. At the Helen iron mine over 1,000 tons of ore per day are being produced. The ore body 180 ft. below the old Boyer Lake level has been found as good as ever. A new shaft 120 ft. deep is being sunk, which gives access to ore 400 ft. below the original bed. Power is being developed by a Berlin, Ont., company at the High fall of Michipicoten river, where there is a descent of 128 ft. to supply the Helen and other mines in the neighborhood, and if the project succeeds some of the gold mines not now in operation may be re-opened.

Thomas Southworth, director of colonization, who recently returned from a visit to the Timiskaming district, reports that on Cobalt lake sand has been found which is rich in cobalt silver and nickel. It is being packed in bags and shipped to New York for treatment. Rich veins of copper and silver ore have been struck on a property near New Liskeard, owned by George C. Coleman, of London, Ontario.

The output of the mines of the Dominion Coal Co. at Sydney, N. S., for May amounted to 294,489 tons, which is the best showing so far made this season. It is understood that the year's output has been sold at satisfactory prices. The company will shortly put one of the latest style of cargo boats, just built at Middlesborough, England, on the route between Sydney and Montreal.

The Egg Lake Oil Co. is pushing development work in the oil fields, near Morrinville, about 25 miles northwest of Edmonton, N. W. T. In boring to a depth of 213 ft. four successive layers of oil sand were run through, two of which were respectively 8 and 12 ft. in thickness. Two derricks have been erected, and pumping machinery and experts to carry on operations are on the way. The oil is elevated by suction pump from the bottom of the well which the oil reaches by filtration. The product is a fine fuel oil ready for immediate use, carrying about 15% of lighter oils. Other companies preparing to operate in this field are the Canadian-American and Edmonton oil companies, the latter of which has begun development work. The three concerns together control by purchase, lease or option about 50,000 acres of land.

The Canadian Reading Camp Association held its annual meeting on June 3 at Copper Cliff. The organization, composed of employers of labor, is to educate the laborers. They propose to experiment in a limited number of camps to ascertain the best methods and to urge the Provincial government to establish educational facilities in all large mining and lumbering camps, etc.

Victoria, B. C. June 5.

The production of lead in British Columbia during ten months of the current fiscal year ending June 30 is stated to have been about 21,400 tons. Official figures, supplied by the inspector under the lead bounty act, show the actual tonnage recovered from lead ores smelted in British Columbia, and upon which the bounty of $15 per ton has been paid, during the ten months ended April 30, to have been 13,398 tons, while the lead in ores exported to Europe, upon which the bounty is $10 per ton, amounted to about 8,000 tons. Of the aggregate production during the period under review, the St. Eugene mine produced more than two-thirds, including the 8,000 tons shipped to Europe. By districts and mining divisions the production was as follows:—*East Kootenay*—Fort Steele division; St. Eugene, 15,637 tons; North Star, 1,146 tons, and Paradise (N. E. Kootenay), 146 tons; total, 16,929 tons. *West Kootenay*—Slocan division: Slocan Star, 675 tons; Ivanhoe, 456 tons; Idaho-Alamo, 399 tons; Reco, 377 tons; Payne, 338 tons; Ruth, 156 tons; Wakefield, 154 tons; Rambler-Cariboo, 131 tons; Fisher Maiden, 85 tons; Last Chance, 76 tons; Comstock, 69 tons; Silver Hustler, 58 tons, and 20 smaller shippers together, 336 tons; total, 3,310 tons. Slocan City division: Enterprise, 69 tons, and six small shippers together, 35 tons; total, 104 tons. Ainsworth division; Highland 360 tons; Lucky Jim, 111 tons, and Whitewater, 61 tons; total, 532 tons. Nelson division; Ymir, 225 tons; Alice, 98 tons,

and Molly Gibson, 13 tons; total, 336 tons. Trout Lake division (Lardeau); Silver Cup, 132 tons; Triune, 55 tons; total, 187 tons.

In connection with the closing of No. 1 shaft of the Western Fuel Company's colliery at Nanaimo, Vancouver Island, the local branch of the United Mine Workers of America, which claims to have recently increased its membership to more than 500 members, is endeavoring to have the questions at issue between the company and the men submitted to arbitration, both parties to choose two representatives and the four so chosen to agree upon a fifth. So far the company has not agreed to this proposal. Meanwhile No. 1 shaft is closed, mules, tools and pumps having been withdrawn. Thomas Burke, a member of the national board of the United Mine Workers, from Illinois, has been addressing meetings of the men and giving publicity through the press to the men's side of the question. He stated that last year, after the pithead at No. 1 had been rebuilt, before the men returned to work, the company notified them that they must pay $2.50 per ton for household coal, the allowance of 25 cents for lamps would be discontinued, and a docking system introduced. On the other hand, the company reduced the price of powder 2½ cents, caps 1 cent and hose ½ cent per ft., besides which it gave $1,000 to the accident assurance fund. He complained that several months ago, when things were considered unsatisfactory by the men, when asked to allow their representatives to interview him, the company's general manager absolutely refused to have anything to do with them, and that their request for 10% advance in wages, made in February, 1903, had been waived at the request of the president of the company on his announcing his intention to put in the best machinery and pay the best wages on the coast, so that he could compete successfully with rival mines. The men had consented, and now they were asked to accept a reduction of 10%. Meanwhile competing mines in the State of Washington, working under less favorable conditions, had advanced wages 40%. The men have declined to accept an offer made by the business men of Nanaimo to pay the cost of transportation between the city and Protection Island shaft, on the grounds that it is the principle involved, not the amount they are contending for. At present there does not appear to be any sign of an agreement being soon reached between the company and the men. In connection with the legislation that precipitated this trouble, it may be mentioned that the superintendent of the Wellington Colliery Company's Extension colliery, and one of the miners, have been charged with a violation of the new amendment to the coal mines regulation act in working more than eight hours underground.

Mexico. June 5.

In the State of Nuevo Leon, La Mina B, at Galeana, has been started up by the Laredo Mining & Smelting Co., and it is said that the company is contemplating the erection of a small smelter. It is also stated that representatives of La Harpe Zinc Co., of La Harpe, Kansas, as well as some prominent Mexican capitalists, are seeking concessions from the government for the erection of a zinc smelter in Monterey. The Monterey Iron & Steel Co. at its last meeting decided to build 60 new coke ovens for the production of coke for its own use. At Los Muertos station on the Mexican National railroad the mines of Los Muertos, adjoining on the northeast the properties of Las Cabrillas, which are leased to the Torreon Metallurgical Co. and ship 3,000 tons a month to the Monterey plant of the American Smelting & Refining Co., are to be exploited by a new company, which holds them under lease and bond.

In Sinaloa the Palmarito, in the Mocorita district, is reported sold to an American company for $125,000, and the Lomas de Oro Mining Co., organized by M. F. Cameron, with a capital of $500,000 gold, has purchased from the Hidalgo & Anexas Mining Co. the Yanco mine, near Rosario.

In Guerrero, T. H. Arthur, of Chicago, has purchased of Jose de la Borda, the old Trinidad mine, near Taxco, for $200,000 gold. In Taxco also, the Mexican Smelting & Refining Co., recently organized in Chicago, with $2,000,000 gold capital, and Lawrence W. Tatum as president and general manager, has just started up work with four little Mexican adobe furnaces, which were on the properties the company has just purchased, while plans are being made for a modern plant, of about 50 tons, to smelt the lead ores from its mines and those in the district. It gives every promise of building up to a respectable plant, for the mines are numerous in that district, and it is only the expense involved in shipping and high treatment charges that have kept them from producing extensively.

London. June 3.

A few weeks ago I contrasted the financial positions of the two great chemical companies, the United Alkali Co. and Brunner, Mond & Co., pointing out that the former company had been floated at the heydey of prosperity of the chemical trade for an enormous capital sum, while the finances of the latter were more jealously guarded. At the meeting of shareholders of Brunner, Mond & Co., held this week, Sir John Brunner made some remarks on this very subject, mentioning that company promoters were continually making propositions to him with the object of re-floating the company with an enlarged nominal capital commensurate with the market valuation of the present shares. To all such overtures he invariably replied that, as he did not want any shareholder ever to part with any of his shares, and did not like to see the shares quoted so high on the market, he would not offer any facility for raising the nominal capital of the company. At the meeting he advised holders never to sell, but to enjoy their substantial dividends earned on a comparatively small capital. In days to come the dividends might be lower, but still remunerative to original shareholders. He did not want at such times to face a body of shareholders that had paid high prices for their shares. It will be seen, therefore, that Sir John Brunner not only reprobates overcapitalization, but looks askance at shareholders who sell out at advanced market quotations. This is incidentally an echo of the excellent business principles on which the finances of the company are managed.

The first actual report of the results of smelting the copper ores at the Etruscan copper mine has been issued this week. It is stated that the 100-ton furnace has been running 76 days, from February 11 to May 21. During that time 134 tons of copper and 6,800 oz. of silver have been produced. Presumably this copper has been sold as matte, not as refined or unrefined metal. It is also stated that there is sufficient ore "in sight" (this is the directors' expression, not mine) to keep this furnace going for 18 months. The prospecting advocated originally by Mr. Fawcett, and more recently by the directors, is being diligently pursued, but only here and there have any orebodies of value been discovered; the formation continues patchy and mostly barren. The report is, as usual, characteristically vague, and the above is mostly a guess at what the directors really mean. No indication as to the cost of treating the ores is given.

The Palmarejo and Mexican Goldfields, Ltd., is now one of the more promising of British mining companies, and under the present direction and management is a great contrast to what it was originally. The reorganization on sound lines began four years ago, when Mr. Southcott became chairman and T. H. Oxnam the mining engineer. It took a long time to remedy previous errors and mismanagement, and these two gentlemen deserve great credit for pulling the company round. A very suitable acknowledgment of their services was made this week, by past and present shareholders, when Mr. Southcott was given £1,000 and Mr. Oxnam £1,500 as a sort of extra bonus. Mr. Oxnam is now giving up the actual management of the properties, but continues as chief engineer, and W. A. Pomeroy has been appointed manager. The latter was for some time manager of Great Fingall in West Australia, and more recently was nominated by Bewick, Moreing & Co. to manage the Great Boulder Perseverance; but owing to the firm's withdrawal from the position of consulting engineers and managers of the company, his appointment was never actually made.

Personal.

Mining and metallurgical engineers are invited to keep THE ENGINEERING AND MINING JOURNAL informed of their movements and appointments.

Mr. F. F. Sharpless is in Turkey.

Mr. Thos. H. Leggett is at Guanajuato.

Mr. George J. Bancroft has returned to Denver.

Mr. H. W. Hardinge sailed for London by the *Umbria*.

Mr. D. W. Brunton is at Butte on professional business.

Mr. Ben S. Revett has returned to New York from Seattle.

Mr. W. A. Prichard has returned to London from Spain.

Mr. R. C. Shaw has returned to New York from Costa Rica.

Dr. L. L. Hubbard, of Houghton, was in New York during the week.

Mr. F. D. Pagliuchi is professionally engaged near Havana, in Cuba.

Mr. Robert T. Hill is examining the Mulatos mine, in Sonora, Mexico.

Mr. Critchley Barker, owner of the *Australian Mining Standard*, is in London.

Mr. R. J. Dickman, of New York, is examining properties in Southern Nevada.

Mr. H. A. Shipman is now manager of the Oroya-Brownhill mine, at Kalgoorlie.

Mr. Henry Trevean Thomas, of Camborne, is leaving Cornwall to go to Brazil.

Mr. J. Langeloth sailed for Europe on the *Blücher*. He will be absent until September.

Mr. Frank W. Oldfield has returned from Ecuador, on a holiday. He is now in Colorado.

Mr. John Maloney is in charge of the mill at the Lluvia de Oro mine in Chihuahua, Mexico.

Mr. G. Melville Boynton is expected in New York on his return from professional work in Chile.

Mr. Robert Gallient has been appointed manager of the Westralia Mt. Morgans, in Western Australia.

Mr. W. A. Wilson, of Salt Lake City, is at Hailey, Idaho, directing the re-opening of the Eureka mine.

Mr. Frank E. Studt has received an appointment with the Tanganyika Concessions, Ltd., in Rhodesia.

Mr. A. A. Talmage, manager of the Blaisdell Co., of Los Angeles, Cal., is in New York on business.

Mr. W. E. Sharon has been appointed superintendent for the Crown Point Mining Co., of Virginia City, Nevada.

Mr. Fred G. Farish has returned from Sonora, Mex., and is at present examining mines near Telluride, Colorado.

Mr. Frank Lewis Nason is on his way to report on several mining properties in Arizona, Colorado and Washington.

Mr. W. S. Heger has been apointed assistant to the president and general manager for the Allis-Chalmers Company.

Mr. Gustave A. Overstrom, professor of metallurgy in the University of Utah, Salt Lake City, is visiting New York.

Mr. Le Roy Scholl has resigned as superintendent for the American Copper Co., Wyoming, and is now at Williamsport, Pennsylvania.

Mr. Claude W. L. Filkins, on account of ill health, has resigned as professor of mathematics in the Colorado School of Mines.

Mr. H. H. Rogers, Jr., has been elected a director of the Amalgamated Copper Co., to succeed Mr. F. P. Olcott, who has retired.

Mr. W. A. Pomeroy, lately in Western Australia, has been apointed manager for the Palmarejo & Mexican Goldfields, Ltd., in Mexico.

Mr. Edward Massay, formerly with the Greene Consolidated Copper Co., now has charge of the Greene mines at Mulatos, Sonora, Mexico.

Mr. E. W. Nash, president of the American Smelting & Refining Co., who has been seriously ill for some time, is reported to be improving.

Mr. N. H. Bodahl has been appointed master mechanic of all the mines of the Amalgamated Copper Co., except those of the Boston & Montana company.

Mr. Julius W. Eggleston has resigned as instructor in geology and mineralogy in the Colorado School of Mines. He will take a special course at Yale.

Mr. C. E. Smith has been appointed instructor in geology and mineralogy at the Colorado School of Mines to succeed Mr. Julius W. Eggleston, who has resigned.

Mr. Morgan Conway, who has been in China, superintending diamond drill work for the Sullivan Machinery Co. for some years, has returned to Negaunee, Michigan.

Messrs. E. H. McDonald and W. G. King, of the Montana School of Mines, were recently in the Black Hills with a party of students, studying cyanidation as exemplified in the local plants.

Mr. W. H. Brulé, formerly superintendent of the North American Copper Co.'s concentrator at Encampment, Wyo., now has charge of the cyanide mill of the Cripple Creek-Homestake Mining & Reduction Company.

Mr. M. O. Johnson, of Ishpeming, Mich., has been appointed mining engineer for the Interstate Iron Co., of Mesabi range, in place of Mr. B. W. Vallet, who has become mining engineer for the Colorado Fuel & Iron Co., of Sunrise, Wyoming.

Mr. Norbert Levy, of the firm of N. Levy & Co., Berlin, is visiting Canada to investigate the mineral resources of the country, more especially copper and nickel ores, in which his firm deals. He hopes to be able to arrange for a supply from the Lake Superior district.

Obituary.

Amos Shepard, of Duluth, Minn., general manager of Mesabi and Gogebic mines for the firm of Corrigan, McKinney & Co., died recently at Whitewater, Wis., where he had gone to recover from an accident. He was well known throughout the Lake Superior region, where he spent his entire business life, and especially in northern Minnesota, where he had been for 23 years.

Societies and Technical Schools.

South Dakota School of Mines.—At the annual commencement of this school three students were graduated as mining engineers.

Michigan School of Mines.—This institution has received an appropriation from the State legislature of $160,000 to defray the expenses for the ensuing year, and to purchase the Pope and Hubbel properties contiguous to the present college grounds.

American Chemical Society.—The last regular meeting of the New York section was held on June 9. The following papers were read: Norman A. DuBois: 'Some Condensation Products of 1 Phenylnaphthalene-2-3-Dicarboxylic Anhydride.' L. H. Friedburg: 'On the Preparation of Hydrobromic and Hydriodic Acids,' 'Two Novel Forms of Laboratory Apparatus.' Charles Baskerville and J. B. Thorpe: 'Præseodidymium Tetroxide.' Charles Baskerville and G. M. MacNider: 'On the Simplicity of Præseodidymium.' Charles Baskerville and A. Bourgougnon: 'Artificial Willemite' (with demonstrations). H. J. Bliss and S. A. Tucker: 'The Production of Boron Carbide from Boric Oxide in the Electric Furnace.' J. B. Whitney and S. A. Tucker: 'The Preparation of Metallic Magnesium and Calcium by Electrolysis.' G. C. Howard and S. A. Tucker: 'The Heat Conserving Qualities of Various Refractory Materials.' H. A. Seil and M. T. Bogert: 'Isomeric Ethers in the Quinazoline Group.' R. R. Renshaw and M. T. Bogert: 'Acyl Derivatives of 4 Aminomethyl-phthalate.'

Trade Catalogues.

The Hayward Co., of New York, has prepared a tasteful little price-list and descriptive catalogue of its digging machinery.

The Capital Gas Engine Co., of Indianapolis, Ind., in its catalogue No. 21, describes and illustrates its gas-engines for various horsepower.

Catalogue L 510 of the Worthington Pump Co., Ltd., London, contains full descriptions, with illustrations, of the air- and gas-compressing machinery made by this company.

The elateroid coatings made by the

Hydrocarbon Manufacturing Co., of Denver, Colo., are described and illustrated in a handsome catalogue recently issued by that company.

The Ingersoll-Sergeant Drill Co., of New York, describes in bulletin No. 2,002 track laying on the Williamsburg Bridge, New York, the drill work of which is done by this company.

'A Few Words About Electric Fans' is the title of bulletin No. 5, issued by the Crocker-Wheeler Co., of Ampere, N. J. It describes, with illustrations, several of the electric fans made by this company.

The Borden & Selleck Co., manufacturer of conveyors, elevators, freight-handling machinery for carrying and elevating boxes, barrels, bales, packages, etc., describes in booklet No. 6 some of its products.

The Ottumwa box-car loaders, hoisting and hauling engines, and other mining and coal-handling machinery are described in an illustrated catalogue issued by the Ottumwa Box-Car Loader Co., of Ottumwa, Iowa.

The Trent Engineering & Machinery Co., of Salt Lake City, Utah, in its catalogue No. 6, describes in detail, with illustrations, the Monadnock mill. There are descriptions also of other mills and machinery made by this company.

Industrial.

The S. H. Supply Co., of Denver, Colo., reports sales of two No. 2 Wild mills to Orson P. Brown, Mexico; one No. 2 Wild mill to Idaho; one No. 1 mill to Arizona, and one No. 1 mill and Wild shaking screen to the Copperopolis Copper Co., Baker City, Oregon. The sales of this crushing mill have been so great that the factory has been taxed to its utmost capacity to turn out the machines fast enough to make prompt deliveries.

The Abner Doble Co., of San Francisco, announces that arrangements have been made with the John McDougall Caledonian Iron Works Co., Ltd., of Montreal, Canada, whereby the latter becomes sole licensee for the manufacture of the Doble system of water-wheels in the Dominion of Canada. The McDougall company has the most extensive machine works in Canada, its plant including machine shops, pattern shop, foundry, forging works and structural material shop. Its plant is therefore well equipped for the manufacture of water-wheels and other hydraulic machinery. It already has in hand the building of a 100-h.p. wheel to operate under 170 ft. head taking water through a 3½ in. jet, and having a speed of 130 revolutions per minute. The Canadian licensee is prepared to furnish the steel pipe, structural work and all machinery necessary for complete power plants, and the Doble company requests that all engineers or parties interested in water-power developments in Canada address the McDougall company direct. It has retained the Abner Doble Co. as its consulting engineers.

The Colorado Iron Works Co., of Denver, Colo., reports the following shipments: To the Great Western Sugar Co., at Fort Collins, Colo., two 11 by 15 in. Dodge crushers and one set of 20 by 12 in. Compromise rolls; to the same company at Loveland, Colo., two 11 by 15 in. Dodge crushers, one set of 20 by 12 in. Compromise rolls, and three carloads of steel tanks and fittings; to the Denver City Tramway Co., one impact screen, one 11 by 15 in. Dodge crusher, and one 60-ft belt elevator and equipment; one impact screen to the School of Mines, Kingston, Ontario, Canada; one set of 27 by 14 in. improved standard crushing rolls to the Mazapil Copper Co., in Mexico; two impact screens to the H. & B. Mining Co., in Colorado; five carloads of sheet-steel dust flues, etc., for the Bingham smelter at Bingham, Utah; two sets of 27 by 14 in. H. rolls to the Success Mining Co., in Montana; one 32-ft. Oxland roaster, dryer and equipment for the Julian Mining Co., in California; concentrating equipments for El Cobre Copper Co. in Cuba; four all iron 'Perfect' pattern ore feeders for the Lone Star Mining Co., in Nicaragua; etc.

The Ingersoll-Sergeant Drill Co. and the Rand Drill Co. have been united into a new company called the Ingersoll-Rand Co. The new corporation was formed under the laws of New Jersey, with a capital of $10,000,000, of which $5,000,000 is preferred stock and the balance common. This is a union of valuable patents and of expert engineers of large experience in this special line of work. It should be advantageous to purchaser as well as manufacturer. Improved machinery and better service will result. The factories of the two companies are located at Phillipsburg, N. J.; Easton, Pa.; Tarrytown, N. Y.; Ossining, N. Y.; Painted Post, N. Y.; Thirty-fourth street, New York City; and Sherbrooke, Quebec. They will all be operated. The officers of the Ingersoll-Rand Co. are as follows: President, W. L. Saunders, formerly president of the Ingersoll-Sergeant Drill Co.; first vice-president, Geo. Doubleday, formerly treasurer of the Ingersoll-Sergeant Drill Co.; vice-presidents: Jaspar R. Rand, formerly president of the Rand Drill Co.; John A. McCall, president of the New York Life Insurance Co.; J. P. Grace, vice-president of W. R. Grace & Co.; Geo. R. Elder, general manager of the manufacturing department; treasurer, W. R. Grace, formerly secretary of the Ingersoll-Sergeant Drill Co.; secretary, F. A. Brainerd, formerly treasurer of the Rand Drill Co. For the present the main offices of the new company will be located at 26 Cortlandt street, New York.

General Mining News.

ARIZONA.

GRAHAM COUNTY.

Arizona Copper Co., Ltd.—The production of this company, at Clifton, for the month of May was equivalent to 1,412 tons of copper.

CALIFORNIA.

CALAVERAS COUNTY.

Chris. Anderson.—This gravel mine is now running full blast, with an average output of 20 oz. per day.

Voinich.—The ditch to convey water to this mine near Angels has been completed, and grading for the new 40-stamp mill has been commenced.

CONTRA COSTA COUNTY.

Gold has been discovered on the ranch of John Virtue, near the little town of Knightsen. The find was made in a creek bed.

EL DORADO COUNTY.

Rio Vista Copper Mining Co.—At this mine they are down 400 ft., or about 140 ft. below the river bed, and are now drifting. A new dam and flume will shortly be built to obtain electrical power.

INYO COUNTY.

Spears.—At this mine, Lone Pine, J. W. Oney, superintendent, at a distance of 1,000 ft. in the tunnel the ledge has been cut where it is seven feet wide. About two feet carry high values.

KERN COUNTY.

Talc.—This mine, near Woody, is working 30 men and the concentrator from the Dreadnought has been purchased to concentrate the ore.

MARIPOSA COUNTY.

Misfortune.—In this group, near the old town of Hildreth, a rich vein has been struck in the lower tunnel. Should the orebody hold out, a mill will be put up.

MERCED COUNTY.

W. A. Bell has bonded 1,000 acres of dredging land near Merced Falls, between that place and Snelling. This includes the I. J. Buckley and other ranches. This is a new field for dredging enterprise.

NEVADA COUNTY.

Union Consolidated.—Work will shortly commence on unwatering this mine, east of Nevada City; Geo. A. Nihell, superintendent. A 560-ft. drain tunnel has been re-opened, and the three-compartment shaft partly re-timbered. There are two 1,500-ft. locations on the property.

Orleans Group.—The drain tunnel of the Prescott Hill claim is being cleaned out, and when finished, sinking will begin. The old workings of the Orleans and of the Huston Hill will be allotted to lessees.

PLACER COUNTY.

Golden West Consolidated Mining Co.—Work for the season is about to be resumed on this mine, on the Forest Hill divide, and it is thought they will strike the channel of the Hidden Treasure mine, as gravel was found at the close of last season's work.

PLUMAS COUNTY.

L. F. White, of Clairville, in developing his mine near that place is taking out ore of a high grade, though the ledge is a wide one—being from 15 to 20 feet.

SAN DIEGO COUNTY.

Julian.—In this old camp work is progressing favorably on a number of mines. The Los Angeles Mining Co. is operating several mines, among them the Warlock and Chapparal, in the latter of which they have struck a blind ledge carrying good values.

SANTA CLARA COUNTY.

A strike of cinnabar ore has been made on the ranch of John D. MacKenzie, about half way between the New Almaden and Guadaloupe quicksilver mine, 11 miles west of San Jose. The find was made while cutting through a small hill on the line of the new road.

SHASTA COUNTY.

Gold Telluride Mining Co.—This company has paid $40,000 for seven quartz claims in Centerville and Muletown districts. These include the Welcome, Sulphide, Gold Dollar and Dixie Queen claim at Centerville; and the Grand Central, A.M. and O.K. claims in Muletown district.

Sunny Hill Mining Co.—At this mine, Igo, the tramway for conveying ore from mine to mill has been completed.

Middle Creek Gold Mining Co.—This company now has 24 men at work on the Dobrowsky claim, H. O. Cummins, manager. A five-stamp mill is being hauled to the mine.

Tehama Queen.—In this mine, Harrison Gulch, drifting has commenced, and it is expected to cut the ledge at about 130 ft. Two shifts of men have been put in.

SISKIYOU COUNTY.

Wild Irishman.—A rich strike has been made in this mine, near Cecilville. The mine is owned by Harvey Bowerman.

Siskiyou Power Co.—This company is installing new machinery on Fall creek, to increase the power plant 1,500 more horse-power. This is necessary because so many mines require more power.

Ricoro Gold Mines Co.—This Los Angeles company is working the Classic Hill hydraulic mine which it bought last year, and is about to instal another giant and enlarge the ditches.

SONOMA COUNTY.

Culver-Baer Quicksilver Mining Co.—At this mine for some time only one side of the furnace has been used, making 45 to 50 flasks of quicksilver per month, on an average of 10 tons of ore daily. Both sides will now be used and the output doubled. The old and new works are also to be connected, to cut down operating expenses.

TRINITY COUNTY.

Morris.—These claims on Indian creek, have been bonded to D. B. Fields, W. E. Lievesly and D. C. Dedrick, who will at once begin active development work.

Fairview Mining Co.—This mine, at Papoose, Jos. H. Porter, manager, now has 30 of its 40 stamps running.

Worthington Mining Co.—This company has been organized to work eight quartz claims, near Quinby creek, in New River district. F. J. Reid, of Eureka, is president, and C. W. Hayden, of same place, secretary.

TUOLUMNE COUNTY.

Tonkins.—J. L. Tonkins has uncovered a new vein in his mine on Wet Gulch, on which free gold shows plainly.

Mustang & Fairoaks.—I. Le Mahieu, or Oregon, has acquired an interest in these claims near Confidence, for which he is erecting a five-stamp mill. The vein is about 8 ft. wide.

COLORADO.

CLEAR CREEK COUNTY.

Clarissa.—Philip Mixsell, of Denver, is installing a plant of machinery on this mine in Virginia cañon, a large body of ore, carrying values of from $8 to $15 per ton, having been opened up, which will pay handsomely with concentration. Property is credited with production of $175,000 gold and silver.

Little Mattie.—A number of lessees are doing well at this property, near Idaho Springs, Pike & Company making a carload shipment which netted over $200 per ton for the first class, while the second class gave values of nearly 3 oz. gold and 20 oz. silver.

Seven-Thirty.—Oscar Johnson & Co., of Georgetown, have opened up a good body of silver ores, and a carload shipment brought them returns of $247.16 per ton, net, while Franchini & Co., another set of lessees, shipped a lot which netted them $217.87 per ton. Property is located near Silver Plume.

Domino.—This group, located in Argentine district, has passed into the hands of the Domino Mining Co., in which Georgetown, Colo., and Ohio parties are interested, and Harvey Cochran, Georgetown, Ohio, is in charge. Power drills are to be purchased in the near future, and operations will be carried on through the tunnel.

GILPIN COUNTY.

Golden Cloud.—Iowa parties are interested in this property in Russell district and they have opened up good orebodies of concentrating ores and are considering the installation of a larger plant of machinery. J. Tobias, of Idaho Springs, is manager of the property.

Silver.—This property in Moon gulch has been leased and bonded to W. G. Smith, of the Denver, Northwestern & Pacific road, W. H. Knowles, of Denver, and other parties; buildings are to be erected, machinery will be installed and active operations of this old-time property will be inaugurated. During its earlier history the production was all milling, but of a very good grade. W. H. Knowles, of Rollinsville, is manager.

Colorado Mining Co.—Centerville, Iowa, parties have become interested in the organization of this company with capital stock of $250,000, and will operate the Colorado group and adjoining claims in Independent district. They are also interested in the erection of a 10-stamp mill going up in Gambell gulch, and are reported to be in shape for shipping. The new officers of the company are: C. A. Farrington, president; J. R. Needham, vice-president; Frank Augustus, Rollinsville, secretary; and O. J. Duffield, Rollinsville, has been appointed manager. The company figures on the installation of an automatic tramway for carrying their ores to the mill.

Gold King.—Denver parties are interested in this property in Union district under the management of G. Carle, of Rollinsville. A plant of machinery has been installed this week and arrangements are being made for the operating of it on a liberal scale.

Pittsburg.—A shipment from the 500 east level by lessees during the past week gave values of 11.35 oz. gold, 20.70 oz. silver, and 10.97% copper, or net value of $244.15 per ton. The property is operated by the Cashier Gold Mining & Reduction Company.

LAKE COUNTY—LEADVILLE.

With the roads in better condition and the smelter in a position to receive ore, the output for May was a little better than 70,000 tons of all classes of ore. With the disappearance of snow from the ranges and outlying sections and the resumption of work in a number of properties in the Sugar Loaf, St. Kelvin, and Alicante districts, the output for the present month should reach 72,000 tons. By the middle of the month it is expected that the big Yak mill will be running full blast and turning out 250 tons daily of a high-grade of concentrate which will materially add to the total output.

Sedalia.—The property has been unwatered and the shaft is now being sunk and will go down another lift of 100 ft. when drifting will start. The old levels are being prospected and all ore worth shipping is being taken down. When the shaft reaches the proper depth the sulphide ore-shoots will be opened.

Dome.—The streak of ore struck a few weeks ago has now opened out to four feet wide, from which several cars of ore have been shipped, returns showing an average value of $20 per ton. Sufficient work has been done on the vein to prove that it is in place and strongly defined. It is the extension of the Reindeer shoot to the northeast.

Laplander.—Hitherto the vein in this property has been small but rich. During the week, in a drift 50 ft. from the surface, the vein widened out to two and a half feet and carries two ounces of gold per ton.

TELLER COUNTY—CRIPPLE CREEK.

Cripple Creek Homestake Gold Mining Co.—Affairs are gradually getting into shape at this property, as far as the treatment of ore is concerned. Quite a little remodeling has been done, and now it is understood that considerable is being handled. The mill has a large capacity and there is a large amount of low-grade ore on the property, and it is only a matter of the values whether it makes a success or not. The whole hillside is being taken out and therefore can be mined very cheaply. All the handling of the product in the mill is done by machinery, and as the ore is well adapted to treatment by the cyanide process the milling does not cost much. The outcome of the property is being watched with interest.

El Paso Consolidated Gold Mining Co.—The large working shaft on this property is being pushed steadily downward. It is understood that the shaft will be put down to a considerable depth. It is now considerably over 800 ft. deep. In the meantime the mine is making a steady production of good-grade ore. With the exception of the Portland, the El Paso is the largest in the district.

Forest Queen.—The shaft on this property has been completed to the 600-ft. point, and a level is being driven to cut the vein. Some ore is also being taken out on the upper levels. The property is under lease to J. K. Walsh and associates.

IDAHO.

BLAINE COUNTY.

Red Elephant.—This property, in Hailey district, belongs to the Quincy Junior Mining Co., made up of Michigan and Utah men. W. G. Page is manager and one of the stockholders. The group occupies a spur between Bullion and Red Elephant gulches and is in a lime formation. From the Red Elephant creek side a crosscut intersects the vein at a distance of 650 ft., and this crosscut is being extended to intersect the Caledonia vein. The vein carries a quartz gangue, bearing galena, gray copper, iron pyrite and some carbonates. It runs 80 to 130 oz. silver, 40 to 70% lead. A mill of 50 tons capacity, equipped for concentration work, is on the property. W. A. Wilson, of Salt Lake City, is consulting engineer.

IDAHO COUNTY.

Gold Reef.—A force of 40 men is employed at this property, near Warren. Manager C. E. Kroh is having the mill equipped for fine grinding and cyanide treatment.

LEMHI COUNTY.

Gold Dust.—Cyanide treatment will be added to the mill of this property at Leesburg. The method of the Holderman Filter Tank Co., of Salt Lake City, has been adopted. The mill capacity is to be increased to 100 tons per 24 hours. Dr. Hasbrook is manager.

SHOSHONE COUNTY.

Bunker Hill & Sullivan Mining & Concentrating Co.—This company has unanimously approved the action of the directors in entering into a contract with the Tacoma Smelting Co. Following this ratification the details of the sale of the holdings of the Bunker Hill & Sullivan Mining and Concentrating Co. in the Tacoma Smelter have been satisfactorily arranged—the sum of $1,591,896.12 being fixed as the price of the 1,567 shares held by the company. From the proceeds of the sale a special dividend (No. 92) of 50 cents per share, equal to $150,000 was paid on May 16, and a second special dividend of $4.50 per share, equal to $1,350,000, has been added to the dividend of 50 cents per share declared upon the May earnings of the company. The balance of the purchase money will be retained by the directors to meet the cost of a tailing mill which it is proposed to erect as an addition to the company's concentrating plant for the purpose of securing still further economy in the treatment of the output of the mine.

LOUISIANA.

CADDO PARISH.

Shreveport.—Producers No. 2 is still in a state of eruption and the hole is 50 ft. in diameter at the surface.

Brown Brothers No. 1 is nearing the dangerous gas stratum, being down over 800 feet.

CALCASIEU PARISH.

Jennings.—A number of crude-oil shippers were given a hearing before the railway commission at Baton Rouge. They are endeavoring to obtain an order compelling the Southern Pacific railway to make prompt delivery of tank cars.

The low price of crude has practically stopped development. The oil in store is estimated at 5,000,000 bbl.; daily production, 30,000.

The Bass & Benchenstein pipe line, which has a daily capacity of 600 bbl., will help shippers, but there seems no present prospect of an advance in crude, and it may go lower than .25c., the present figure.

NEVADA.

ESMERALDA COUNTY.

Lida District.—This location is 28 miles southeast of Goldfield. The formation is lime and schist, with veins in both and on the contact of the two. The ore in the lime carries chloride and bromide of silver, with some lead. It has some old properties that were worked in early days. More recent work has developed gold and copper-bearing veins, with some free gold. The Wisconsin, an old mine, is being reopened. The Florida mine, having a 5-stamp mill, has been opened to water level and into sulphide ore. Lida is near the head of Death valley and is 65 miles from the Carson & Colorado railroad. The Tule Cañon district is 12 miles south of Lida, and is the location of old placer mines, where it is said some dredges are to be built. Silver Peak district, west of Goldfield, is reviving and attracting much interest.

NYE COUNTY.

Gold Reed.—This is in the Kawich range of mountains, 65 miles east of Goldfield. The formation is andesitic, having a system of parallel veins. The Gold Reed group, of which M. L. McDonald is manager, is said to have veins of ore running $20 to $7,000 per ton in gold. The Kawich range trends north-south and the veins cut through it at right angles. It is a matter of interest to report that a good supply of water has been obtained in this camp.

Reveille.—This is an old district, 75 miles east of Tonopah, and 35 miles north of Kawich camp. It is in Reveille mountains, one of the numerous north-south ranges of Nevada. The S. W. Nevada Mines Co. has here a property that is characteristic of the district. It has veins of lead and silver on a contact of lime and quartzite, the ore being a good grade.

STOREY COUNTY—COMSTOCK LODE.

Crown Point Mining Co.—At the annual meeting, last week, 90,467 shares were voted, and the following directors were elected: James Newlands, Jr.; John P. Martin, C. L. McCoy, A. F. Coffin and James Newlands, Sr. Officers were elected as follows: James Newlands, Jr., president; J. P. Martin, vice-president; C. L. McCoy, secretary, and W. E. Sharon, superintendent.

NEW JERSEY.

HUDSON COUNTY.

Arlington Copper Co.—In the suit brought by Dignowity and other stockholders to set aside the sale of this company's property at Arlington, the Court of Chancery has given its decision, rejecting the plaintiff's claim and confirming the sale. The Bergen Industrial Co. is the present owner of the property, under the sale.

NEW MEXICO.

LINCOLN COUNTY.

New Mexico Railway & Coal Co.—The entire capital stock of the company, carrying with it the ownership of 457 miles of railroad from Liberal, Kan., to El Paso, Tex., with extensive coal fields, had been sold to Phelps, Dodge & Co. The main line of this road forms a connection between the Rock Island and the Southern Pacific and Mexican Central roads. The company has $3,000,000 common stock and $1,000,000 of preferred stock, besides mortgages on the various properties aggregating $11,500,000. The annual report for 1903 showed surplus earning over interest charges and taxes of $158,251.

OREGON.

BAKER COUNTY.

Mayflower.—The new strike of the large body of rich ore in the lower workings of this mine is proving the opinion of experts formerly made in the Last Chance vein in the Cornucopia camp, as the Mayflower adjoins that property and its ore veins extend into it. Manager Boggs is now shipping his 10-stamp mill to the property and will instal it as soon as possible.

Virtue.—The Sagebrush Cyanide Co., J. H. and F. J. Davey and H. L. McLane, and John L. Rand, of Baker City, under the management of McLane as local superintendent, is operating on an experimental proposition which has been proven a success. On the reports of the Daveys the company was formed and purchased the tailing of this old mine, 6 miles east of Baker City. This tailing is estimated to contain about 250,000 tons, and the tests made by the company produce a profit of several dollars to the ton above operating expenses. The plant established consists of nine cyanide tanks designed and constructed by Geo. A. Carter. This is a new industry entirely in this camp, and the tanks have been built of Baker City lumber, which proves to be just as good as the California redwood ordinarily used for this purpose, and at considerable saving in freight charges to the local company. The Oregon lumber even seems to be superior to the red-wood, and does not consume the cyanide or leak, and the company figures that it has saved one-half its cost of construction in the using of the Oregon timber.

The cyanide solution flowing through the tailing in the tanks, extracts the gold and carries it to the zinc boxes, where it is precipitated on the zinc shavings as metallic gold. This product is then dissolved in sulphuric acid, which takes out the zinc and leaves the gold, which is shipped to the government assay office.

Uncle Sam Mining & Milling Co.—This company, controlled by W. J. Cornwall, of Cadillac, Mich., and T. M. Anderson, of Baker City, owner of the Jed Blair placers near Malheur City, southeast of Baker, has commenced operations and is taking out iron ore. These grounds comprise 300 acres of patented placers and 11 quartz claims. Mr. Anderson also controls the Daisy quartz mine group, 5 miles east of Malheaur, on which they have just erected a 30-ton Bryan mill, and will begin operations crushing out ore and turning out bullion from a high-grade quartz vein in which many tons of ore have already been blocked out.

Cornucopia.—Pierre Humbert, Jr., of San Francisco, has taken over for himself and associates, under option, these mines, which have been in litigation for some time past, and closed down because of legal complications, and he will at once proceed to prospect the properties, and if they prove what he thinks them to be, will open them on a large scale.

PENNSYLVANIA.

BITUMINOUS COAL.

The strike of the miners at the Morris Run mines, which has lasted over a year, has been finally settled. Both parties have agreed to the Altoona wage scale, which governs the mines of the central part of Pennsylvania.

TEXAS.

HARDIN COUNTY.

Batson.—F. M. Gilbrough has a new 1,000-bbl. gusher on the Millhome tract.

Solinsky & Horkins are drilling their No. 6. The daily output is 9,000 bbl; prices, 25 to 28.

Saratoga.—Rio Bravo Oil Co. No. 214 is flowing water and will be deepened. No. 221 has been brought in after much labor and is doing 1,500 bbl. No. 222 is doing 300 barrels.

International Oil Co. No. 2 is in again and flowing 1,000 bbl. daily.

Britton Oil Co. No. 1, after four months' work, is in and flowing 400 barrels.

Santa Fé No. 7 is being deepened, and Sun Oil Co. No. 1 has been abandoned. The daily production is about 8,000 bbl. Crude brings .25c.

HARRIS COUNTY.

Batson.—The production continues very large, running about 100,000 bbl., and prices remain at .16c., with no prospect of an early advance.

JEFFERSON COUNTY.

Big Hill.—The Texas Oil Fields Co., Ltd., after a large expenditure of money, have abandoned operations at 2,500 ft. They had showings of oil, but not in paying amounts.

MC LENNAN COUNTY.

Bosque.—Several pumpers have been developed here, and the first car of crude will be shipped to Corsicana next week. The crude is claimed to be the best grade yet discovered in Texas.

UTAH.

JUAB COUNTY.

Mammoth.—The Mammoth Mining Co., whose mine is in Tintic district, has made a contract with the United States Smelting Co. to take the output of the mine for three years. In consequence of this the force at the mine is to be increased.

SALT LAKE COUNTY.

The Western Ore Separating Co. is erecting at Salt Lake City a 250-ton plant for handling zinc-lead-iron ores. It will have 30 Blake separators, the work of which is magnetic and electrostatic, and which will handle the rosen-jack or non-magnetic ores. The purpose is to handle crude ores as well as tailing from other mills that handle ores containing zinc. The company will doubtless get zinc ores from Park City, Frisco, Big and Little Cottonwood, in Utah, and from Wood river and Coeur D'Alenes, Idaho. Herbert Harris is president of the company, W. G. Swart, secretary, with J. M. McClave as superintendent of the plant.

Deep Creek.—A shipment of ore from the property of the Dewey Mining Co., in Deep Creek country, brought $400 per ton on the Salt Lake market. Development is in progress and other shipments will follow.

TOOELE COUNTY.

Honerine.—The drain and transport tunnel of the Honerine Mining Co., at Stockton, has been driven nearly 8,000 ft. and another 1,000 ft. must be driven before the orebodies of the property are reached. The flow of water at present is 7,000 gal. per minute. This water supplies the concentrating mill and irrigates a 100-acre patch of oats and alfalfa on the company's ground to produce feed for its ore teams. About 13,000 tons of ore per month are mined, one-third of which is shipped direct to the smelters, two-thirds being concentrated. This ore supply is taken from the 1,100-ft. level, which is reached through the old incline. This level is 250 ft. higher than the main drain tunnel. The ore consists of a lead, iron and copper sulphide. The shipping ore runs 60% lead, 30 oz. silver, 3% copper, $1.50 gold. The mill ore runs approximately 15% lead, 12 oz. silver, 1% copper and 80c. gold. The concentration reduces about 3½ tons to one ton, making a product about equal in value to the first-class shipping ore. E. J. Raddatz, the superintendent, states that all ore will be taken out through the main tunnel on the completion of the later to the ore zone.

WASHINGTON.

FERRY COUNTY.

Ben Hur.—In May, 660 tons of ore was shipped to the British Columbia smelter, at Greenwood, B. C. The ore is of the ordinary average value. An upraise on ore from the 230-ft. to the 115-ft. level has been started northward from the shaft, with one machine drill. Another machine drill is used in driving northward on the vein on the 115-ft. level.

Morning Glory.—A shaft on the pay shoot is down 20 feet.

Belcher.—Right of way is being cleared for a gravity tram, for the conveyance of oxidized ore down the mountain. This ore is of low grade, but is claimed by the management to be valuable for flux in reduction at the smelters.

Mountain Boy.—A lot of assorted ore was shipped to the smelter recently, and the mine closed down indefinitely.

Keller & Indiana Smelting & Development Co.—The water flume has been completed to the outskirt of the town of Keller. More machinery has been unloaded at the smelter site. Foundations for the smelter are under way.

PIERCE COUNTY.

Tacoma Smelting Co.—Stock of this

company purchased by the Alaska Mexican Gold Mining Co., the Alaska Treadwell Gold Mining Co. and the Alaska United Gold Mining Co. has been sold. These companies have made an arrangement by which all concentrate shipped from their mines shall be treated at the Tacoma smelter.

Foreign Mining News.

AFRICA.

RHODESIA.

Messrs. Pauling & Co., contractors for the extension of the Cape to Cairo railway beyond the Victoria falls, have received a cable from their representatives in Rhodesia to the effect that the railway and telegraph lines have reached Kalomo, the headquarters of the Northwestern Rhodesia administration. Kalomo is 90 miles north of the falls, and the construction of the 250 miles to the Rhodesia Broken Hill will be proceeded with immediately.

CANADA.

BRITISH COLUMBIA—BOUNDARY DISTRICT.

Boundary Ore Shipments.—Shipments for the week ending June 3 were as follows, in tons: Granby, 13,495; Mother Lode, 3,392; Mountain Rose, 66; Emma, 99; Oro Denoro, 33; Last Chance, 60; total for the week, 17,145 tons; total for year to date, 395,349 tons.

Mining Stocks.

(See quotations on page 1173.)

New York. June 14.

Notwithstanding various happenings supposed to favor the market, it is still mainly professional, and the public seems to be taking little interest. The summer dullness has set in, ahead of time. On the Exchange, Amalgamated Copper was lower, closing at $79¾.

On the curb market there was a good deal of excitement over the Greene stocks; all sorts of rumors were current about them, especially when it was learned that Henry Ollesheimer and E. B. Tustin had handed in their resignations last week as directors of the Greene Consolidated Gold Co. and the Greene Gold-Silver Co., while Mr. Ollesheimer has also resigned from the board of the Greene Consolidated Copper Co. No statement was made public about the matter. At the close Greene Consolidated Copper had declined to $20¼ and Greene Gold to $3¾. It was denied, however, that the directors who had resigned were selling their stocks. Tennessee Copper had a very quiet week, closing at $25. British Columbia showed some dealings, closing around $7@$7½.

The Comstocks and Cripple Creek mining stocks were wholly uninteresting for the week, and show very few sales.

Boston. June 13.

Outside of a few stocks, the mining-share market here has been a dull affair the past week. Greene Consolidated has been the center of attraction. After stiffening, $1.37½ to $24.50, it broke to $20.75 today, rallying to $21.62½, closing $2 below a week ago at $21.37½. There are many stories afloat to account for the steady decline and large offerings, but the consensus of opinion seems to be that there is internal dissension of some sort and a likelihood that the dividend may be reduced. According to Director Galen L. Stone, of this city, the company has suffered many cave-ins, etc., due to the prolonged dry weather, which caused considerable expense. This was charged against the cost of copper. Profits during May were about $220,000, or about $45,000 in excess of the month's proportion of the dividend.

Amalgamated was strong last week, advancing $3.75 to $81.87½, but broke to $78.62½ today on predictions from Lawson that the stock would fall to $30 per share. The exhibit of the constituent companies for the year, as filed with the State of Montana, makes a favorable reading.

Allouez has been in good request, although the range has been from $23 to $21.50, closing at the latter. President Day, who is at the property, sends favorable advices. Isle Royale has also been among the active ones, although it is off $1.25, net, for the week to $18.25.

Colorado Springs. June 9.

The mining market has been quite active here during the past week, although sales have been rather light. El Paso, which sold one week ago around $1.95, sold down to $1.77 during the week, but recovered on today's markct to $1.95. This company has declared another monthly dividend of 3c. per share, amounting to close to $75,000. Portland is selling at $2.25 to $2.28 on light sales. Elkton remains at about the same figure as one week ago, selling around 43c. Findley has declined about 2c., selling around 73. Gold Sovereign is selling at 11½; Acacia, 9⅛; Isabella, 30½; Vindicator, 87@89; C. K. & N., 10@12½c. per share.

San Francisco. June 8.

Ophir has been steadier, recovering part of last week's tumble. Otherwise the Comstocks were rather heavy and buying slow. Ophir closed around $6.75; Consolidated California & Virginia, $1.65; Hale & Norcross, $1.45; Mexican, $1.20; Savage, 47c.; Sierra Nevada, 35c. per share.

The Tonopahs were also rather quiet, but generally steady. Montana Tonopah closed at $2.80; Tonopah Midway, $1.60@$1.65; Jim Butler, 70c.; North Star, 52c.; McNamara, 48c.; Original Bullfrog, 35c.; Black Butte, 30c.; Kawich, 20c. per share.

On the California Exchange, trading in oil shares was very dull, buyers taking no interest. Sales were noted of Keru River at $10.50; Oil City, 64c. per share.

Coal Trade Review.

NEW YORK, June 14.

ANTHRACITE.

The hard-coal market is unusually quiet, its condition almost resembling that normally anticipated in July. Some improvement, however, may be expected before the end of the month, in order to save the July advance in price. The scarcity of egg and stove has been relieved, and these sizes are now in good supply. The steam sizes are in abundant supply, although this has had no effect on their price.

Prices f.o.b. New York harbor shipping ports during June will remain as follows: Domestic sizes, $4.45 for broken, and $4.70 for egg, stove and chestnut. Steam sizes remain at the same figures as last week: $3 for pea; $2.25@$2.50 for buckwheat; $1.45@$1.50 for rice, and $1.30@$1.35 for barley.

The reported tonnage of anthracite coal for the five months ending May 31 is as follows; the figures being in long tons:

	1904		1905	
	Tons.	Per ct.	Tons.	Per ct.
Reading	4,536,902	19.3	5,025,941	20.2
Lehigh Valley	3,908.176	16.6	4,050,591	16.3
N. J. Central	2,969,059	12.6	3,221,137	13.0
Del., Lacka. & W.	3,811,480	16.2	3,861,359	15.5
Del. & Hudson	2,393,976	10.2	2,402,432	9.7
Pennsylvania	1,898,011	8.1	2,047,006	8.2
Erie	2,325,396	9.9	2,440,638	9.8
N. Y. Ont. & W.	1,081,340	4.6	1,175,801	4.7
Del., Sus. & Schuylkill	604,072	2.5	648,040	2.6
Totals	23,528,412	100.0	24,872,945	100.0

The total increase was 1,344,533 tons, or 5.7%. Every company showed an increase.

BITUMINOUS.

The Atlantic seaboard soft-coal trade is inclined to be quiet, although fair tonnages are moving forward, without much snap or vim, however. Very little coal is banked up at any one point; the receiving ports seem to be handling their arrivals with promptness and coal is arriving with more regularity. At the loading ports, the main-line railroads are keeping a sharp lookout for accumulations, and at the first appearance of such a thing, car supply at the mines is cut down. A few small contracts have been closed during the week, but this business is practically ended for the season.

Trade in the far East is dull, orders coming forward slowly. Trade along the Sound is brightening as consumers are beginning to devote to soft coal some of the attention which they have been paying to anthracite. Trade in New York harbor is quiet and prices remain at around $2.35 f.o.b shipping ports, for fair grades of steam coal. All-rail trade is fairly active, the usual tonnage moving forward, together with some additional shipments which are asked for from time to time. Transportation from mines to tide is excellent and car supply is regulated only by the promptness with which shipments are handled at the discharging ports.

The coastwise vessel market shows a plentiful supply of vessels, with rates somewhat lower. Philadelphia quotes as follows: To Boston, Salem and Portland,

65@70c.; to Lynn, Newburyport and Gardner, 90c.; to Portsmouth, 70c.; to Saco, 90c.@$1 and towages; to Bath, 75c.; to the Sound, 55 cents. New York quotes to around the Capes, 55@60 cents.

The coal tonnage originating on the Pennsylvania Railroad lines east of Pittsburg and Erie for the five months up to June 1 was as follows, in short tons:

	1904.	1905.	Changes
Anthracite	1,836,847	1,942,262	I. 105,415
Bituminous	11,431,693	11,618,676	I. 186,983
Coke	3,699,385	4,648,200	I. 948,815
Total	16,967,925	18,209,138	I. 1,241,213

The increase this year was 7.3%, in the total shipments.

Birmingham. June 12.

All attention now is directed to the convention of the United Mine Workers of America, Alabama district No. 20, which began here today. The attendance, while not as large as it was a year ago, is still of considerable proportion. Despite the strike which has been on for twelve months almost, the delegates all appear to be in good humor and are prepared for a lengthy session. The election of officers will not cause much interest, the old officers, with the exception of the district board members, being renominated. The reports of the officers will be mainly in regard to the strike. All miners working at the Commercial Coal Co. mines have been contributing from 50c. to $1 per week toward the strikers. A large percentage of the miners who went out on strike were able to secure work in the Commercial coal mines or elsewhere. The colored members of the union stuck well to their white brethren in the organization.

Chicago. June 12.

Except in the demand for fine coals, the Chicago wholesale trade is dull. In the city business is slightly better, owing to a feeling that the teamsters' strike has worn itself out and that the employers have won. Actual conditions of the strike have changed but slightly, but deliveries are being made more regularly, and the confidence of the public is being slowly restored, with no extended rioting or general peril to non-union drivers any longer intimated by the newspapers. Country trade is at last learning that strike reports have been exaggerated, and there is a revival of confidence manifested in the coal trade.

Screenings from Western mines bring $1.20@$1.50; run-of-mine, $1.50@$1.60; and lump—when it can be sold—$1.80@$2.15. The demand for lump is very light. Eastern coals are in light demand, but are mostly steady, little demurrage coal of any sort being on tracks. Hocking is quoted at $2.90@$3.15; Smokeless at $2.95@$3.15, and Youghiogheny at $2.85@$3. Anthracite business continues very dull, notwithstanding strong efforts by the retailers to stir up trade among their customers.

Cleveland. June 14.

The ending of the lake rate controversy between the vessel owners and the coal shippers has resulted in a much freer movement of coal up the lakes. The result has also been a relief from the congestion in the local market on steam coal. There are not now apparent so many indications of over-production of coal, showing that one of the prime causes of that appearance was the failure of shippers to send forward the material produced for them. The sales of lake coal have also increased, now that the price has dropped to about rock bottom. Lake ¾-in. coal is being sold at $1.90 f. o. b. vessels at Lake Erie ports.

The steam coal situation has accordingly improved, and while no radical changes have been made in prices it is apparent that the congestion has been greatly relieved. Both Ohio and Pennsylvania steam run-of-mine have been selling at 90@95c. at mines, with an increasing tendency toward the latter figure and some reports that the material has been bringing $1 at mine.

The coke situation is still weak. This is aggravated by the lessening of consumption at the furnaces and foundries, while production has continued at the same lively pace. The prices are weak at $2.50@$2.75 for the best grades of 72-hour foundry coke, and $2@$2.25 for furnace coke.

Pittsburg. June 13.

Coal.—A rise in the rivers enabled shippers to send fully 4,000,000 bush. of coal to the lower ports on Friday. Several million bushels were brought down from the pools to the harbor, that did not get out on the rise. The rivers likely will be navigable again before the end of the month. The mines continue in full operation and railroad cars are up to requirements. Shipments to the lake ports are being rushed and it is now regarded as certain that all contracts for delivery in the northwestern markets will be filled. Prices are about the same on a basis of $1@$1.10 for run-of-mine.

Connellsville Coke.—Prices remain about the same, furnace coke being quoted at $1.80@$1.90, and foundry at $2.40@$2.60 a ton. The production in the region for the week was 253,916 tons, a decrease of 1,500 tons compared with the previous week. The shipments amounted to 11,917 cars distributed as follows: To Pittsburg and river points, 4,610 cars; to points west of Pittsburg, 6,138 cars; to points east of Everson, 1,160 cars. This was a decrease of 42 cars compared with the previous week.

San Francisco. June 8.

The local coal trade continues quiet. The demand for domestic coal is light. Steam coal continues to feel the competition of fuel oil, both in factory and steamboat use. This keeps down prices, and current quotations are unchanged.

For Coast coals, in large lots to dealers, prices are as follows: Wellington, New Wellington and Richmond, $8; Roslyn, $7; Seattle and Bryant, $6.50; Beaver Hill and Coos Bay, $5.50; White Ash, $5.25. For Rocky Mountain coals, in car lots, quotations are: Colorado anthracite, $14; Castle Gate, Clear Creek, Rock Springs and Sunny Side, $8.50. Eastern coals are nominal at $14 for Pennsylvania anthracite, and $13 for Cumberland. For foreign coal quotations are, ex-ship: Welsh anthracite, $13; cannel, $8.50; Wallsend and Brymbo, $7.50 per ton.

Foreign Coal Trade. June 14.

Imports of fuel into Belgium for the four months ending April 30 were as follows, in metric tons:

	1904	1905	Changes.
Coal	1,242,549	1,300,405	I. 57,856
Coke	119,555	118,964	D. 591
Briquettes	16,980	17,464	I. 484
Total	1,279,084	1 436,833	I. 57,749

The chief imports were from Germany, France and Great Britain. Exports for the four months were as follows:

	1904.	1905	Changes.
Coal	1,544,635	1,457,163	D. 87,472
Coke	297,718	343,785	I. 46,067
Total	1,842,353	1,800,948	D. 41,405

The coal exports were chiefly to France and Holland. The increase in coke this year was due to exports to Germany.

The coal production of Germany for the four months ending April 30 is reported as follows, in metric tons:

	1904.	1905.	Changes.
Coal	39,721,693	35,981,428	D. 3,740,265
Brown coal	15,952,645	16,929,962	I. 977,317
Total mined	55,674,338	52,911,390	D. 2,762,948
Coke made	3,966,557	3,754,967	D. 211,590
Briquettes made	3,685,978	3,977,936	I. 291,958

Of the total mined this year, 33,290,912 tons of coal and 14,342,800 tons of lignite, or brown coal, were from the Prussian mines. The decrease in coal mined was due to the miners' strike, early in the year.

Iron Trade Review.

NEW YORK, June 14.

The iron market generally shows but little change from last week. In pig iron one or two of the local markets report a slight improvement, but in the primary markets there is a tendency to take future contracts at somewhat reduced prices. Both foundry and bessemer are reported lower in Pittsburg, and the Southern furnaces have receded from their demands, and are taking as low as $12 at furnace, in some cases. Production has been falling off a little, but the number of furnaces in blast is still large.

In finished material there is more business, and a better tendency reported in plates and structural material; but bar iron and other branches of the trade are rather dull. Most of the material now taken is going into railroad equipment, for which the demand is very large.

Pig Iron Production.—The weekly productive capacity of the anthracite and coke furnaces in blast on June 1 was 442,000 tons, or about 10,000 tons less than on May 1. The estimate of production made by the *Iron Age* is 1,967,586 tons for May. Taking the same estimate for the preceding months of the year, and making an allowance for the charcoal furnaces, the total production for the five months ending May 31 appears to have been 9,383,000 tons. The unsold stocks reported on June 1 were 399,750 tons, an increase of 63,105 tons during May. These stocks do not include iron held by the steel companies for their own use.

Birmingham. June 12.

The Southern pig-iron market is dull. There has not been a very active demand lately, though the inquiry is looking up. The furnacemen are anxiously waiting for a change for the better to come on. Iron quotations are a little dejected, No. 2 foundry being quoted at $12@$12.50 per ton. Rumors have prevailed in the last few days that even a lower price than this has been received, but this is denied by the manufacturers. The production is not as strong right now as it was a fortnight ago. The Sloss-Sheffield Steel & Iron Co. has blown out one of its North Birmingham furnaces for repairs. There is a little accumulation still to be noted. There appears to be a confident feeling in the Southern territory, and by July it is believed there will be a steady demand.

The following quotations are given for pig iron: No. 1 foundry, $12.50; No. 2 foundry, $12@$12.50; No. 3 foundry, $11.50@$12; No. 4 foundry, $11@$11.50; gray forge, $11; No. 1 soft, $12.50; No. 2 soft, $12@$12.50.

The Kilby Iron & Locomotive Works, of Anniston, Ala., are interested in iron works to be erected at North Birmingham. J. C. Maben, president of the Sloss-Sheffield Steel & Iron Co., has gone East to attend a meeting of the directors of the company. Usual quarterly dividend on preferred stock, payable in July, will be ordered.

Chicago. June 12.

Quietness continues in the iron market, and to all appearances will continue until the summer months are past. Buyers are confining their orders to immediate necessities—that is, those of the next two or three months—leaving the usual contract business for six to nine months ahead almost begging. The volume of business and the individual orders are both small. There are numerous inquiries for large amounts of iron on the usual terms of delivery, but very few of these result in orders. The user of iron, apparently, is contented with the present situation and he would seem to be justified in his belief by the general conditions.

For two or three months the market has been weak for pig iron, and it is weaker now than it has been since the beginning of the year. It is admitted by selling agents that any fair order of Southern can be bought for $12.50 Birmingham, or $16.15 Chicago. This is $1 less than the same iron could be bought for three months ago. Northern shares the weakness, though there seems to be less Northern iron than Southern in the market; present quotations are $17 for Northern, against $17.50 earlier in the year, and an order considered a good one from the selling agent's point of view doubtless can be placed at 25c. to 50c. less.

There is yet a large amount of iron to be contracted for to close the deliveries of 1905, and the least evidence of a decided change toward firmer prices probably will result in a rush to place these orders. The orders will not be placed while the market is in its present unsettled condition, nor while every melter looks toward a lowering of prices, due to over-production. Conversation with users of iron generally reveals their belief that over-production exists and that a waiting policy is good for the buying side of the market.

Coke is unchanged, the supply being fairly well regulated to the rather light demand, and the prices firm, Connellsville 72-hour bringing $5.15@$5.40, with standard cokes 25@60c. lower.

Cleveland. June 14.

Iron Ore.—In consequence of the improvements in the dock machinery, additions to the yard space adjacent to the Lake Erie docks and the splendid supply of cars, ore is coming down the lakes at a record rate of speed this season. Boats carrying 8,000 to 10,000 tons of ore are being unloaded in a single day, with no delay. While this speed is being maintained, there is no easiness in the lake rates. This grows out of the fact that the boats are now engaging in the coal trade and there is not a surplus of tonnage in the ore trade. The rates of carriage remain steady at 75c. from Duluth; 70c. from Marquette and 60c. from Escanaba.

Pig Iron.—The demand for bessemer, basic and malleable irons has increased during the week. Buyers show a disposition to cover their needs for the remainder of the year. The market has been stronger, therefore, with the price of all three materials holding firm at $15 in the Valleys. There has been some good buying of malleable and heavy inquiries are in for basic. The fact that the Steel Corporation is not going to buy bessemer iron this summer acts as somewhat of a drag upon that market. The foundry trade has been a little easier. Some off irons have sold at $15 in the Valleys for No. 2, but standard iron is quoted almost universally at $15.50 in the Valleys. There is very little buying as yet for future requirements.

Finished Material.—The demand has improved for bar iron and the hardening of prices in the West has removed the soft spots from this territory. Some iron had been sold at 1.45c. at mill, but now the general run of quotations is about 1.50c. at mill. The mills in this territory will shut down about July 1 for the purpose of making repairs. The demand for structural is so strong that stocks have been reduced in the jobbers' yards and most of the small mills are oversold at premiums. Billets are stronger and the general rail situation shows improvement.

New York. June 14.

Pig Iron.—Business has been quiet, and very little selling has been done, except in small quantities for short deliveries. Some dealers think foundrymen are getting near the end of their stocks, but the latter seem to be taking only moderate interest in the market. The waiting policy, or the absence of sales, which amounts to a good deal the same thing, has had its effect in a general weakening of prices.

For Northern iron, in large lots, we quote: No. 1X foundry $16.75@$17.25; No. 2X, $16.25@$16.75; No. 2 plain, $15.75@$16.25; gray forge, $14.50@$15. Sales have been nearer the lower than the higher limit. Virginia foundry has been held at $17.15@$17.65, but with no sales the price is purely nominal. Southern iron shows the effect most, and quotations are now down on a basis of $12.25@$12.50, Birmingham for No. 2. For large lots on dock, we quote: No. 1 foundry, $16.75@$17; No. 2, $16@$16.50; No. 3, $15.50@$16; No. 4, $15@$15.50; No. 1 soft, $16.75@$17; No. 2 soft, $16@16.50; gray forge, $14.75@$15.

The warrant market on the Produce Exchange still remains very quiet. Latest sales have been on a basis of $14.50 bid, $15 asked, June, July and August delivery, for regular warants; $15 bid, $15.75 asked, same deliveries for foundry warrants.

Bars.—Bar iron is selling in a retail way only. Quotations are nominally the same. 1.595@1.645c., large lots on dock. Steel bars are 1.645c. These prices could probably be shaded on a desirable order. Store trade is moderate only, with quotations 1.70@2c. delivered.

Plates.—Plates are in better demand than almost anything else in the market, but in small lots. Tank plates are 1.745@1.795c.; flange and boiler, 1.845%1.945c.; universal and sheared plates, 1.645c. up, according to width.

Structural Material.—Like plates, there was considerable business in small lots. Some large contracts have been talked about, but most of them have been negotiated directly with Western mills. Beams under 15 in. are 1.745c. for large lots; over 15 in. 1.845c.; angles are 1.745c. tidewater delivery.

Steel Rails.—Standard sections continue $28 per ton at mill, but hardly any business is done in the market. Girder and trolley rails are more active. Light rails

are quiet, prices ranging from $24 for 12-lb., up to $21 for 35-lb. rails.

Old Material.—The market is dull, and dealers are inclined to take any good offers. No. 1 railroad wrought can be had for $17.50@$18; yard wrought, $15@$15.50; machinery cast, $13.25@$13.75. Heavy steel melting scrap is in better demand at $14.50@$15. These prices are on cars, Jersey City, or other terminal delivery.

Philadelphia. June 14.

Pig Iron.—The general slowing up of demand in crude iron is the natural result of prolonged activity on the part of buyers, and the restricted offerings of the past two or three weeks are, of course, due to the oversold condition of practically every furnace in our territory. A careful inquiry substantiates all that has been heretofore said concerning the strength of prices. There are rumors of coming weakness, but no amount of inquiry among the very best sources shows any substantial grounds for lower quotations until a good deal of the business now placed is disposed of. The possibility of a slight reaction in prices is recognized. The coke market is being watched with interest by our people. It appears, though, that the supply of coke will be regulated to the demands of the market. The consumption of all kinds of pig iron continues at a maximum scale. The large local consumers are at present out of the market. Some inquiries are reaching our people from New England sources, but business has not yet resulted. The only encouraging inquiries looking to large business are for basic iron, but those who are asking for it are not in present need. No. 1 X foundry is $18 to $18.25; No. 2X foundry, $17.50 asked; standard gray forge, $16 asked; basic, $16.25; low phosphorus, $20.50.

Bars.—The spring rush for bars is over and there are some symptoms of dullness which may result in two or three mills coming to single turn. A number of mills are not crowded, as they were a few weeks ago, and this is giving an opportunity to accumulate a little stock which the stores will take, as their assortments have been pretty well broken up. Refined iron is quoted at 1.63½ and steel bars are still in very urgent request.

Sheets.—The present distribution is for the very best grades of sheet iron in small lots for special purposes.

Pipes and Tubes.—There is a heavy consumption of boiler tubes throughout our entire territory and discounts continue at 44% on steel tubes from 1 to 1½ in. diameter. The business in pipe continues at about the same level.

Merchant Steel.—The use of merchant steel is on the increase in the East, because of the urgency of buyers who desire deliveries before the end of June.

Plates.—The plate market is developing more activity in a retail way—that is, in small orders ranging from 25 tons and upward. There is an urgent inquiry arising out of new business which has been placed within a few days. Buyers are urgent in arranging for deliveries. Tank iron is 1.73½ to 1.78½c.

Structural Material.—Inquiries for large quantities are reaching the mills in this State from both Eastern and Western sources and there seems to be no end to the demand. Some of our structural mills are cornered when it comes to making definite promises of delivery.

Scrap.—The scrap market has dropped off suddenly and but little business is now being done. A good deal of scrap has been gathered up or located, and is being offered at terms favorable to buyers. No. 1 steel scrap was bought this week at $14.50; choice railroad is rather scarce, but it can be had if the buyer is willing to pay $16; machinery scrap is to be had at $14; wrought-iron pipe scrap is quoted at $12.50.

Pittsburg. June 13.

About the only encouraging feature in the pig-iron market this week is in the unusual number of inquiries received. Indications point to some active buying, but at lower prices than have ruled for several months. The United States Steel Corporation has not blown out any additional furnaces, as was expected, and has not come into the market for outside iron. It is believed a number of furnaces will go out in a short time, and that it will be necessary to place a large order with merchant furnace interests. J. G. Butler, Jr., chairman of the Bessemer Pig Iron Association, in his monthly report, says that on June 1 there were 92% of the furnaces reporting to the association and using Lake Superior ore, in operation, which is the same number reported on May 1. The Republic Iron & Steel Co., the Cambria Steel Co. and the Pennsylvania Steel Co. each have 100% of their furnaces in operation; the United States Steel Corporation, 95%, and the Bessemer Pig Iron Association, 90%. Since June 1 the Corporation has blown out about 10 furnaces, but no changes were made in the operation of the merchant furnaces in the Mahoning and Shenango valleys. Prices in all grades are weaker, particularly foundry and forge iron. Bessemer iron in small lots is selling at $15, Valley furnace, and for a good order it is believed $14.75 could be done. No Southern iron has been sold here for some time, but it is reported that $12.50, Birmingham, can be done for foundry No. 2. Northern foundry also has declined, and sales of small lots during the week were made at $15.50, Valley, for No. 2, and a large lot might be had at $15, equivalent to $15.85, Pittsburg. The Cambria Steel Co. and the Lackawanna Steel Co. may buy iron for delivery after July 1, and if the Corporation places an order for third quarter, the decline in prices will be checked.

The demand in nearly all lines of finished steel products continues, especially structural material and plates. Prices are weaker in sheets, and production in sheets and tin-plate is being curtailed. A number of union plants of the American Sheet & Tin Plate Co. are scheduled to suspend operations this week, and unless the wage scale is settled with the Amalgamated Association of Iron, Steel & Tin Workers all the union mills will be closed on June 30. Specifications on sheets and tin-plate have been better in the past week, and some new business has been booked, but there is more shading in sheets. The plate and structural mills will be kept busy until fall with the orders now on hand, and new business is coming in. The steel car companies during the week added a number of orders for steel cars, and all the plants will be kept running all year.

One of the best indications of a bright outlook in the iron and steel trade is shown in the wage settlement made by the Republic Iron & Steel Co. with the Amalgamated Association. It had been predicted that the company would fight the association and operate its plants on non-union basis upon the expiration of the present agreement on June 30. Instead, a satisfactory adjustment of the scale was reached at the conference held in Detroit last week. While the full demands of the association were not conceded, the workers will receive an advance in nearly every department. The puddling rate is advanced from the base of $4.90 a ton to $5 a ton when bar-iron prices run from 1c. to 1.2c. and the rate increases 25c. with every 0.10c. advance in price above 1.2c. The average selling price of bar iron for March and April was 1.5c., and under the present scale the puddling rate is $5.37½. If the sales for May and June average that price, the puddling rate for July and August will be $5.75 a ton. The scale for the muck and puddle mills was advanced 2½%. The base of the scale for piles on boards was made $1.57, instead of $1.63, as demanded. In the scale for busheling on sand bottom, the increase asked was cut cut in half and the base was fixed at $2.05, instead of $2.20. The advance asked in the knobbling scale was granted, the base being $4.60 for scrap and $5.99 for refined iron. A cut was made in the scale for heating slabs and shingling, the base being changed from 74.4c. to 71c. The demand for an advance of 13% in the scale for bar and 12-in. mills was rejected and the present scale was adopted. Some other changes of advantage to the workers were made, and no reductions whatever were made in any of the existing scales. All the independent union concerns are expected to sign the scale adopted by the Republic Company.

Pig Iron.—Sales for the week were confined to small lots and prices are lower.

A large number of inquiries have been received and there may be some active buying soon. Bessemer pig iron is quoted at $15, Valley furnaces; foundry No. 2 at $15.85@$16.25, Pittsburg, and gray forge at $15.10@$15.35, Pittsburg.

Steel.—Prices of both bessemer and open-hearth billets are easier for prompt shipment, and quotations are not given for extended delivery. Some small sales of bessemer billets have been made at a shade above the pool price of $21, but open-hearth billets command a premium of $2. It is believed that, for shipment over the next three or four months, very close to the pool price could be done. Merchant steel bars remain at 1.50c. and plates at 1.60c.

Sheets.—The market is weaker, sales being reported at 2.35c. for black sheets No. 28 gauge, no business being done at the established price of 2.40c. It is believed that on a desirable order 2.30c. could be done. Galvanized sheets are quoted at 3.45c. for No. 28 gauge, but this price might be shaded.

Ferro-Manganese.—The market is unchanged, 80% domestic being quoted at $49@$50 per ton.

Cartagena, Spain. May 27.

Iron and Manganiferous Ores.—Messrs. Barrington & Holt report that the shipments for the week were one cargo, 3,900 tons manganiferous ore, to Great Britain. The local market is unchanged. Several contracts are reported for delivery in the second half of the year.

Quotations for ordinary 50% ore are 6s. 3d.@6s. 6d.; special low phosphorus, 6s. 10d.@7s. 6d.; specular ore, 58%, 9s. 6d.; S. P. Campanil, 9s. For manganiferous ores quotations vary from 9s. 9d. for 35% iron and 12% manganese, up to 14s. 6d. for 20% iron and 20% manganese.

Pyrite.—Iron pyrite, 40% iron and 43% sulphur, is quoted at 10s. per ton. No shipments reported.

Chemicals and Minerals.

June 14.

In general trade is fairly active, with prices for the most part unchanged.

Copper Sulphate.—The price remains at $4.80 for large lots, with considerably more for small quantities.

Acids.—The market remains strong.

Nitric acid, 36°, 100 lb	$5.00
38°, 100 lb	5.25
40°, 100 lb	5.50
42°, 100 lb	5.75
Oxalic acid, com'l, 100 lb	$5.00@ 5.25
Sulphuric acid, 50°, bulk, ton	13.50@14.50
60°, 100 lb. in carboys	1.05
60°, bulk, ton	18.00@20.00
66°, 100 lb. in carboys	1.20
66°, bulk, ton	21.00@23.00

Sulphur and Pyrite.—Prime sulphur is quoted in New York, Boston and Portland at $20.50; in Philadelphia and Baltimore at $20.75. Pyrite continues unchanged at 10@11 per unit of sulphur for lump ore, and 8.5@10.5 for fines f.o.b. Atlantic ports.

Nitrate of Soda.—Spot is quoted at $2.40 for 96%, and $2.35 for 95%. Contracts can be fixed due monthly, July to December inclusive, at $2.27½ for 96% and $2.22½ for 95%; monthly from December inclusive, 1906, for $2.15 for 96%, and $2.10 for 95 per cent.

Sulphate of Ammonia.—Gas liquor is quoted at $3.10@$3.15 per 100 lb., or a shade less for large orders.

Phosphates.—The phosphate market shows great activity. The Australian demand continues large, and the Japanese requirements, already large, will increase with the prospect of the end of the war.

Phosphates.	F. o. b.	C. I. F. Gt. Britian or Europe.
*Fla., hard rock	$7.25@7.50	$10.67@11.85
land pebble	3.75@4.00	7.70@ 8.40
†Tenn., 78@80%	4.35@4.40	10.27@10.67
78%	3.75@4.00	.....
75%	3.40@3.50	.....
68@72%	3.00@3.25	.....
‡So. Car. land rock	3.75@4.00	.....
river rock	3.50@3.75	6.33@ 6.61
Algerian, 63@70%	.....	7.04@ 7.71
58@63%	.....	6.15@ 6.60
Tunis (Gafsa)	.....	6.00@ 6.60
Christmas Isle	.....	13.28@14.11
Ocean Isle	.....	13.60@14.45
Somme, Fr.	.....	11.39

*F. o. b. Florida or Georgia ports. †F. o. b. Mt. Pleasant. ‡On vessel Ashley River, S. C.

Liverpool. June 6.

Messrs. Joseph P. Brunner & Co. report that trade generally in heavy chemicals is quiet, while quotations are without change.

Soda ash is selling at the usual range as to destination, and for tierces nearest values may be called about as follows: Leblanc ash, 48%, £5 to £5 10s.; 58%, £5 10s. to £6 per ton, net cash; ammonia ash, 48%, £4 5s. to £4 10s.; 58%, £4 10s. to £4 15s., net cash. Bags, 5s. per ton under price for tierces.

Soda crystals move off pretty freely at generally £3 7s. 6d. per ton less 5%, for barrels, or 7s. less for bags; with special terms for a few favored markets.

Caustic soda is not active, although there is a fair amount of business passing in a quiet way, and prices are steady as follows: 60%, £8 15s.; 70%, £9 15s.; 74%, £10 5s.; 76%, £10 10s. per ton, net cash. Special quotations for export to the continent and a few other export quarters.

Bleaching powder is only in moderate request for export, and hardwood is quoted at from £4 10s. to £4 15s. per ton, net cash, as to market.

Chlorate of potash continues to be quoted at from 3 1-16d. to 3 3-16d. per lb., net cash, as to quantity and market, with a limited trade reported at the range named.

Bicarbonate of soda is in request at £6 15s. per ton, less 2½%, for the finest quality in one cwt. kegs; with usual allowances for larger packages, also special terms for a few favored markets.

Sulphate of ammonia is quiet at about £13 per ton, less 2½%, for good gray 24-25% in double bags f. o. b. here.

Nitrate of soda is less active, but spot quotations are nominally unchanged at £11 2s. 6d. per ton for ordinary, up to £11 7s. 6d. per ton for refined, for double bags f. o. b. here, less 2½ per cent.

Metal Market.

New York, June 14.

Gold and Silver Exports and Imports.

At all United States Ports in April and Year.

Metal.	April.		Year.	
	1904.	1905.	1904.	1905.
G'ld Exp	$19,670,157	$1,303,874	$23,857,796	$25,319,188
Imp	10,389,869	2,581,057	22,404,911	11,803,259
Exc	E. $9,180,288	I. $1,277,183	I. $8,547,115	E. 23,515,879
Silv. Exp	3,832,758	2,317,599	16,859,052	14,930,051
Imp	2,115,486	2,559,858	9,039,839	9,075,214
Exc	F. $1,617,322	I. $242,259	E. $7,819,213	E. $5,854,837

These exports and imports cover the totals at all United States ports. The figures are furnished by the Bureau of Statistics of the Department of Commerce and Labor.

Gold and Silver Exports and Imports, N.Y.

For the week ending June 10, and for years from January 1.

Period.	Gold.		Silver	
	Exports.	Imports.	Exports.	Imports.
Week	$127,600	$99,617	$815,557	$ 65,307
1905	33,118,146	5,268,759	14,308,575	1,719,789
1904	63,524,415	3,040,532	18,719,176	379,629
1900	13,586,758	2,963,074	8,066,900	982,630

The silver exports went chiefly to London. The imports were from Mexico, the West Indies and South America. Gold exports were to the West Indies and Panama.

The Treasury Department's estimate of the amounts and kinds of money in the United States on June 1 is as follows:

	In Treasury.	In Circulation.
Gold Coin (inc. bullion in Treasury)	$181,320,951	$650,979,108
Gold Certificates	36,851,970	482,910,999
Silver Dollars	18,910,912	73,617,644
Silver Certificates	5,687,897	460,462,103
Subsid. Silver	13,503,978	100,473,489
Treasury Notes of 1890	33,709	9,583,291
U. S. Notes	14,396,323	332,284,693
Currency Certif.	.....	.....
Nat. Bank Notes	13,968,127	474,359,389
Total	$284,673,867	$2,584,670,716

Population of the United States June 1, 1905, estimated at 83,143,000; circulation per capita, $31.09. For redemption of outstanding certificates an exact equivalent in amount of the appropriate kinds of money is held in the Treasury, and is not included in the account of money held as assets of the Government. This statement of money held in the Treasury as assets of the Government does not include deposits of public money in national bank depositaries, to the credit of the Treasurer of the United States, and amounting to $69,482,820. The amount in circulation on June 1 shows an increase of $6,664,030 over that reported May 1; and an increase of $75,391,799 over June 1 of last year.

The statement of the New York banks —including the 53 banks represented in the Clearing House—for the week ending June 10 gives the following totals, comparison being made with the corresponding week of 1904:

	1904.	1905.
Loans and discount	$1,042,093,300	$1,089,520,900
Deposits	1,109,231,200	1,123,832,800
Circulation	38,088,000	46,575,100
Specie	231,642,500	205,492,700
Legal tenders	81,227,700	85,293,000
Total reserve	$312,870,200	$290,785,700
Legal requirements	278,307,800	280,958,200
Balance surplus	$34,502,400	$9,827,500

Changes for the week this year were increases of $946,200 in specie, $302,100 in circulation and $3,777,225 in circulation; decreases of $330,200 in legal tenders, $12,644,900 in deposits and $11,762,900 in loans. The decrease in loans is a notable point in the statement.

The following table shows the specie holdings of the leading banks of the world. The amounts are reduced to dollars:

	Gold.	Silver.
New York	$205,492,700	.....
England	191,368,220	.....
France	573,382,585	$222,103,335
Germany	201,190,000	67,065,000
Spain	74,025,000	110,700,000
Netherlands	33,868,000	31,192,500
Belgium	15,750,000	7,375,000
Italy	112,225,000	18,192,000
Russia	522,650,000	32,130,000
Austria	238,340,000	65,855,000

The returns of the Associated Banks of New York are of date June 10 and the others June 8, as reported by the *Commercial and Financial Chronicle* cable. The New York banks do not report silver separately, but specie carried is chiefly gold. The Bank of England reports gold only.

Shipments of silver from London to the East for the year up to June 1 are reported by Messrs. Pixley & Abell, as follows:

	1904.	1905.	Changes.
India	£4,819,303	£3,031,871	D. £1,787,432
China	126,062	502,968	I. 376,906
Straits	58,103	2,800	D. 55,303
Totals	£5,003,468	£3,537,639	D. £1,465,829

Exports for the week were £158,600 to India and £31,198 to China; a total of £189,768. Imports were £139,000 from New York, £5,000 from the West Indies, and £5,000 from Australia; a total of £149,000, all bar silver.

Indian exchange has been firm, although the demand for money in that country is not pressing, and exports have fallen off. The Council bills offered in London were all taken at an average of 15.96d. per rupee. Buying of silver for Indian account has not been heavy; but Chinese purchases have been on a considerable scale.

The silver market has been steady, with good inquiry from India. The fluctuations have been very slight, and there is no special feature to indicate a change.

The United States Assay Office in New York reports receipts of 96,000 oz. of silver for the week.

The reports of heavy buying of silver in London for Continental—presumably Russian—account, do not seem to have been based on fact. No such buying has been apparent in the market.

Prices of Foreign Coins.

	Bid.	Asked.
Mexican dollars	$0.45½	$0.47½
Peruvian soles and Chilean pesos	.42	.45
Victoria sovereigns	4.86	4.87
Twenty francs	3.87	3.90
Spanish 25 pesetas	4.78	4.82

Other Metals.

Daily Prices of Metals in New York.

June	Copper. Lake, Cts. per lb.	Copper. Electrolytic, Cts. per lb.	Copper. London, £ per ton.	Tin. Tin, Cts. per lb.	Lead. Lead, Cts. per lb.	Spelter. New York, Cts. per lb.	Spelter. St. Louis, Cts. per lb.
8	14⅜ @14⅝	14⅝ @14½	65¾	30⅛	4.50	5.15	5.00
9	14⅜ @14⅝	14⅝ @14½	65¾	30⅛	4.50	5.15	5.00
10	14⅜ @14⅝	14⅝ @14½	....	30⅛	4.50	5.15	5.00
12	14⅜ @14⅝	14⅝ @14½	....	30⅛	4.50	5.15	5.00
13	14⅜ @14⅝	14⅝ @14½	66	30⅜	4.50	5.15	5.00
14	14⅜ @14⅝	14⅝ @14½	65⅞	30⅜	4.50	5.15	5.00

London quotations are per long ton (2,240 lbs.) standard copper, which is now the equivalent of the former g. m. b's. The New York quotations for electrolytic copper are for cakes, ingots or wirebars. Cathodes are usually 0.25c. below the price of electrolytic.

SILVER AND STERLING EXCHANGE.

June.	Sterling Exchange.	Silver New York, Cents.	Silver London, Pence.	June.	Sterling Exchange.	Silver New York, Cents.	Silver London, Pence.
8	4.87	58⅜	27	12	4.8695	58⅛	....
9	4.87	58⅜	27	13	4.87	58⅛	26¾
10	4.8695	58⅛	26 15/16	14	4.87	58⅛	26 15/16

New York quotations are for fine silver, per ounce Troy. London prices are for sterling silver, .925 fine

Copper.—The market has been quiet but steady, with some business doing from day to day, both for home trade and export. Manufacturers are busy and look for a good summer trade. Prices are unchanged at 14¾@14⅞ for lake; 14⅝@14¾ for electrolytic in cakes, wirebars or ingots, and 14⅜@14½ for cathodes; 14¼@14⅜ for casting copper.

The standard market has moved within narrow limits, between £65 15s. and £66, closing at £65 17s. 6d. For refined and manufactured sorts we quote: English tough, £68 10s.@£69; best selected, £70 10s.; strong sheets, £78; India sheets, £74; yellow metal, 6⅜d.

Exports of copper from New York and Baltimore for the week ending June 10 are reported at 3,945 long tons. Imports of copper for the week were 71 tons. There was also imported copper ore and matte valued at $22,382 in all.

Tin.—The market has improved in consonance with the advance in London, and a fair business has been done at about 30⅜c.

The London market has risen to £138 for spot and £136 15s. for three months.

Lead.—The market is active and a considerable business has been done. Prices are unchanged at 4.42½ St. Louis and 4.50 New York.

The London market continues very firm and prices have advanced to £13 for Spanish and £13 1s. 3d. for English.

St. Louis Lead Market.—The John Wahl Commission Co. telegraphs us as follows: Lead is quiet; 4.42½c. is the price for both Missouri and argentiferous lead.

Spanish Lead Market.—Messrs. Barrington & Holt report from Cartagena, Spain, under date of May 27, that the price of silver has been 14.25 reales per oz. Exchange has been 33.13 pesetas to £1. Local quotations for pig lead has been 70 reales per quintal, which, on current exchange, is equal to £11 16s. 7d. per long ton, f. o. b. Cartagena. Shipments for the week were 400 tons desilverized and 104 tons argentiferous to Great Britain; 234 tons argentiferous to Marseilles; 100 tons desilverized lead to Amsterdam.

Spelter.—The market is dull and we hear of few transactions. Prices are unchanged, the metal being quoted at about 5c. St. Louis and 5.15 New York.

The London market is slightly better, good ordinaries being quoted £24 and specials £24 5s. per ton.

St. Louis Spelter Market.—The John Wahl Commission Co. telegraphs us as follows: Spelter is strong. Latest sales here are on a basis of 5.10@5.12½c. East St. Louis. Demand in the last few days has been quite liberal, and if this continues we believe prices will go higher.

Spanish Zinc Ore Market.—Messrs. Barrington & Holt report from Cartagena, Spain, under date of May 27, that the market is rather depressed. Prices continue nominally 75 fr. per ton for blende, 35% zinc, and 45 fr. for calamine, 30% zinc; but miners will have to accept lower figures, or hold the ore.

Antimony.—There is a good demand for this metal at the higher prices now ruling —10½@11½c., according to the brand.

Nickel.—The large producers quote nickel at 40@47c. per lb., for lots of one ton or over, according to size and conditions of order. For small quantities as high as 60c. is named.

Platinum.—Quotations are firm at $20.50 per oz. Gas-engine sparking points vary from 87c. each for "A," to $1.80 for "B."

Platinum in manufactured forms is strong. Messrs. Eimer & Amend, of New York, quote for different forms as follows: Heavy sheet and rod, 75c. per gram; foil and wire, 80c.; crucibles and dishes, 85c.; perforated ware, 90c., and cones, $1 per gram.

Quicksilver.—Quicksilver is unchanged, $38@$39 per flask—75 lb.—being asked for large orders. For small quantities, $40 is paid. San Francisco prices are $38 for domestic orders, and $36.50@$37 for export. The London price is easy at £7 7s. 6d. per flask, from both first hands and jobbers.

Manganese Alloys.—Prices for manganese alloys in Germany are given by Herr Paul Speier as below. The prices are for orders of not less than 500 kg., delivered in Bremen, and are as follows, per 100 kg.: Manganese copper, No. 1, guaranteed 30% manganese, 265 marks; No. 2, 28 to 30% manganese, for bronze, etc., 175 marks; No. 3, 25 to 20% manganese, with 2 to 4% iron, 165 marks. Manganese tin, No. 1, free of iron and guaranteed 55% manganese, 365 marks; No. 2, 55% manganese, with some iron, 225 marks. Manganese nickel, No. 1, free of iron, 450 marks; No. 2, carrying some iron, 270 marks.

Manganese metal is quoted at 3.60 marks per kg.—38.8c. per lb.—delivered in Bremen.

Cadmium.—Metallic cadmium, guaranteed 99.5%, in lots of 100 kg. or over, brings 7.10 marks per kg., net cash, f.o.b. Hamburg, in shipping packages. This is equal to 76.65c. per pound.

Thallium.—Thallium is quoted at 60@65 marks per kg.—equal to 64.8@70c. per lb. —at Breslau, Germany.

Minor Metals.—For minor metals and their alloys, wholesale prices are f. o. b. works:

	Per lb.
Aluminum.	
No. 1, 99% ingots	33@37c.
No. 2, 99% ingots	31@34c.
Rolled Sheets	4c. up.
Aluminum-Bronze	20@23c.
Nickel-alum	33@39c.
Bismuth	$2.10
Chromium, pure (N. Y.)	80c.
Copper, red oxide	50c.
Ferro-Molybdenum (50%)	$1.00
Ferro-Titanium (20@25% N. Y.)	75c.
Ferro-Chrom. (74%)	12½c.
Ferro-Tungsten (37%)	45c.
Magnesium, pure (N. Y.)	$1.60
Manganese (98@99% N. Y.)	75c.
Manganese Cu. (30@70% N. Y.)	40c.
Molybdenum (98@99% N. Y.)	$2.75
Tantalic acid (N. Y.)	50c.
Phosphorus, foreign	45c.
Phosphorus, American	70c.
Tungsten (best)	$1.25

Variations in prices depend chiefly upon the size and conditions of orders.

Missouri Ore Market.

JOPLIN, June 10.

The highest price reported paid for zinc ore was $44 per ton, the assay basis price ranging from $38 to $41 per ton of 60% zinc. Lead prices advanced $1 per ton, choice bins selling at $60 per ton and 70% grades at $55 to $58 per ton.

The shipment of zinc was increased over the previous week 113 tons, the lead shipment increased 132 tons, and the combined value of the two ores was greater by $13,135. Compared with the same week of last year the past week's shipment is larger by 2,093 tons of zinc, 347 tons of lead and in value $133,740. The 23 weeks of this year show a decrease of 6,627 tons of zinc and 1,202 tons of lead, but an increase of $1,005,425 in value.

The bear movement begun in earnest three weeks ago has forced zinc prices down until some of the mines will be closed as a matter of necessity. The purchasing agents, by this bear movement, have made it easy to restrict the output next month, and concerted action is being quietly urged among the leading producers, to close down their mills three weeks from tonight and remain closed down for at least two weeks, while mid-summer improvements, changes and repairs are being made. Few of the mills have been stopped since last July for general repair work, and they need a thorough overhauling. It is now almost certain that the output will be restricted during the two weeks approximately 4,500 tons, and a lower market may see the restriction reduce the tonnage of output over 5,000 tons.

Following are the shipments of zinc and lead ores from the various camps of the district for the week:

	Zinc, lb.	Lead, lb.	Value.
Joplin	2,590 200	227,270	$60,980
Carterville-Webb City	2,667,980	752,870	76.500
Galena-Empire	594,850	60,510	13,640
Duenweg	6 2.030	109 920	16,420
Prosperity	327,270	91,290	9,360
Alba	439,810	.....	9,240
Oronogo	250 450	23,590	5,470
Carthage	185,190	.....	5,990
Aurora	728,000	.....	10,920
Badger	369,800	1,850	7,810
Granby	325,000	38,(00	5,100
Neck City	714.260	10,740	18,450
Zincite	120,560	1,700	2,580
Baxter	66,920	.....	600
Spurgeon	140,28)	6,000	1 280
Sherwood	111,730	.....	2,350
Central City	124,300	.....	2,490
Beef Branch	88,660	8,010	920
Reeds	164,100	.....	3,410
Wentworth	143,100	.....	2,400
Stott City	58,510	.....	1,230
Totals	10,914,000	1,431,750	$257,140
23 weeks	219,480,420	26,451,130	$5,684,345

Zinc value, the week, $215,000; 23 weeks, $4,929,525
Lead value, the week, 42,140; 23 weeks, 754,820

Monthly Average Prices of Metals.

COPPER IN NEW YORK.

Month.	Electrolytic.		Lake.	
	1904.	1905.	1904.	1905.
January	12 410	15 008	12 553	15.128
February	12.063	15.011	12.245	15.136
March	12.299	15.125	12.551	15.250
April	12.923	14.920	13.120	15.045
May	12.758	14.627	13 000	14.820
June	12.269	.....	12.399	.....
July	12.380	.....	12.505	.....
August	12.343	.....	12.468	.....
September	12.495	.....	12.620	.....
October	12.993	.....	13.118	.....
November	14.284	.....	14.456	.....
December	14.661	.....	14.849	.....
Year	12.823	.....	12.990	.....

Prices are in cents per pound. Electrolytic quotations are for cakes, ingots or wire bars; cathodes are usually 0.25c lower.

COPPER IN LONDON.

Month.	1904.	1905.	Month.	1904.	1905.
Jan	57.500	68.262	July	57.256	.....
Feb	56.500	67.963	August	56.952	.....
March	57.321	68.174	Sept	57.645	.....
April	58.247	67.017	Oct	60.012	.....
May	57.321	64.875	Nov	65.085	.....
June	56.398	.....	Dec	66.384	.....
			Av., year.	58.587	.....

Prices are in pounds sterling, per long ton of 2,240 lb., standard copper.

TIN IN NEW YORK.

Month.	1904.	1905.	Month.	1904.	1905.
Jan	28.845	29.325	July	26.573	.....
Feb	28.087	29.262	August	27.012	.....
Mar	28.317	29.523	Sept	27.780	.....
April	28.132	30.525	Oct	28.596	.....
May	27.718	30.049	Nov	29.185	.....
June	26.325	.....	Dec	29.286	.....
			Av. year.	27.986	.....

LEAD IN NEW YORK.

Month.	1904.	1905.	Month.	1904.	1905.
Jan	4.347	4.552	July	4.192	.....
Feb	4.375	4.450	Aug	4.111	.....
Mar	4.475	4.470	Sept	4.200	.....
April	4.475	4.500	Oct	4.200	.....
May	4.423	4 500	Nov	4.200	.....
June	4.496	.....	Dec	4.600	.....
			Av., year.	4.309	.....

SPELTER.

Month.	New York.		London.	
	1904.	1905.	1904.	1905.
January	4.863	6.190	4.673	6.032
February	4.916	6.139	4.717	5.989
March	5.057	6.067	4.841	5.917
April	5.219	5.817	5.038	5.667
May	5.031	5.434	4.853	5.284
June	4.760	.....	4.596	.....
July	4.873	.....	4.723	.....
August	4.866	.....	4.716	.....
September	5.046	.....	4.896	.....
October	5.181	.....	5.033	.....
November	5.513	.....	5.363	.....
December	5.872	.....	5.720	.....
Year	5.100	.....	4.931	.....

SILVER.

Month.	New York.		London.	
	1904.	1905.	1904.	1905.
January	57.005	60.690	26.423	27.930
February	57.592	61.023	26.665	28.047
March	56.741	58.046	26.164	26.794
April	54.202	56.600	24.974	26.108
May	55.430	57.832	25.578	26.664
June	55.673	.....	25.644	.....
July	58.095	.....	26.760	.....
August	57.806	.....	26.591	.....
September	57.120	.....	26.349	.....
October	57.923	.....	26.760	.....
November	58.453	.....	26.952	.....
December	60.563	.....	27.930	.....
Year	57.221	.....	26.399	.....

The New York prices are per fine ounce; the London quotation is per standard ounce, .925 fine.

Dividends.

Company.	Payable.	Rate.	Amount.
Alaska Mexican	June 6	$0.75	$135,000
Alaska Treadwell	June 6	6.30	1,320,000
Alaska United	June 6	.50	90,100
Calumet & Arizona	June 19	2.00	400,000
†Calumet & Hecla	June 23	10.00	1,000,000
†Copper Range	July 1	1.00	383,781
†Daly West	June 15	.60	108,000
El Paso		.03	75,000
†Federal Min. & Sm., com	June 15	2.50	125 000
†Federal, pf.	June 15	1.75	175,000
§Greene Copper	June 20	.40	345 600
†Guggenheim Explorat'n Co.	July 1	1.75	183,750
Iron Silver	July 1	.10	50,000
‡Maryland Coal	June 30	2 50	47,125
Maryland Coal	June 30	1 ex.	18,850
National Lead, pf.	June 15	1.75	260,820
†Standard Oil	June 15	9.00	8,730.000
Uncle Sam	June 24	.01	5,000

*Monthly. §Bi-monthly. †Quarterly. ‡Semi-Annually.

Assessments.

Company.	Delinq.	Sale.	Amt.
Caledonia Silver	July 7	July 28	.10
Centennial Copper, Mich.	Aug. 10	.....	2.00
Challenge Con., Nev.	June 14	July 7	.10
Confidence, Nev.	June 6	June 26	.20
Exchequer, Nev.	July 7	July 28	.05
Justice, Nev.	June 13	July 6	.05
Middle Yuba, Nev.	July 7	.....	.01
New Almaden, Mex.	July 20	.....	.00½
Overman, Nev.	June 16	July 7	.10
Yellow Jacket	June 27	Aug. 1	.10

STOCK QUOTATIONS.

NEW YORK

Name of Company.	Week, June 13. High.	Week, June 13. Low.	Closing. High.	Closing. Low.	Sales.
Alice	70				400
Amalgamated	81⅞	77½	80⅞	78⅝	221,520
Anaconda	26½	25⅝	26⅜	25⅝	1,750
Con. California & Virginia	1.55	1.45			450
Elkton Consolidated	47	40	47	46	1,000
Federal Min. & Smelt					
Federal Preferred	93	92⅞			200
Greene Copper	24½	20⅞	21⅝	20⅛	60 100
Greene Gold	5½	3¾	4½	3¾	48.500
Homestake					
Horn Silver					
Iron Silver	3.50				200
Isabella	32	30	31		1,800
Little Chief					
Ontario					
Ophir			6.00		100
Portland	2.30	2.20	2.20		450
Quicksilver					
Quicksilver Preferred					
Standard	1.60				100
Tennessee Copper	25	24½			300
United Copper	25½	23	25½	23	7.500

Total sales, 344,370.

BOSTON

Name of Company.	Par Val.	Week, June 13. High.	Week, June 13. Low.	Closing. High.	Closing. Low.	Sales.
Allouez	$25	23	21⅜	22⅛	21⅜	3,573
Amalgamated	100	81⅞	77½	80¾	78⅝	25,945
Atlantic	25	14	13	13⅜	13	740
Bingham Consolidated	50	29¼	28½	28¾	28½	755
Bonanza Development	10	55	50			525
Boston Consolidated	10	8¼	8	8		1,775
Calumet & Hecla	25	610	601	610		42
Catalpa	10					
Centennial	25	18¾	18	18		495
Consolidated Mercur	5	55	45	49		320
Copper Range Consolidated	100	71½	68	68¾	68	3,630
Daly-West	20	14	12¾	13	12¾	430
Elm River	12					
Franklin	25	8¼	8	8		60
Granby	10	6	5½	6	5¾	2,875
Greene Consolidated Copper	10	24¼	20¾	21¾	20¾	24,875
Guanajuato Consolidated	5	5				100
Isle Royale Consolidated	25	19⅜	18½	19⅛	18¼	1.240
Mass Consolidated	25	8¼	7½	8⅛	7½	1,430
Mayflower	25					
Michigan	25	12¾	12¼	12¾	12½	1,755
Mohawk	25	50½	49⅜	50⅛	49⅛	705
Old Dominion	25	25⅞	23½	24¾	24¼	1,685
Osceola	25	92¼	90	92¼	91⅛	877
Parrot	10	23½	21⅞	22¼	21⅞	500
Phoenix Consolidated	25	1⅛	1			355
Quincy	25	98	95	98	95	35
Shannon	10	7⅝	6¾	7⅛	6¾	1,096
Tamarack	25	107	105	105		11
Tennessee	25					
United Copper, common	100	25¾	23	24	23	2,870
United States	25	29⅛	28⅛	29	28¾	4,388
United States Coal & Oil	25	10				1
Utah Consolidated	5	44¾	43½	44¼	43⅞	1,958
Wolverine	25	110	109	109		30

Total sales, 85,026 shares.

MEXICO. June 2

Company.	Prices, Mex. Bid.	Prices, Mex. Ask.
DURANGO:		
Penoles	$2,600	$2,800
San Andres de la Sierra		
GUANAJUATO:		
Cinco Senores y An., aviadoras	15	20
Cinco, Senores y An., aviada	32	40
Providencia, San Juan de la Luz	143	154
GUERRERO:		
Garduno y Anexas	25	30
HIDALGO:		
Amistad y Concordia	55	58
Carmen aviada	160	174
Guadalupe Fresnillo Mill	170	200
Guadalupe Fresnillo Mine	70	80
Maravillas y An., aviador	75	100
Maravillas el Lobo	130	180
Refugia, aviada	5	7
Sta. Gertrudis y An., aviadas	8	10
Sta. Gertrudis y An., aviadora	52	54
San Rafael y An., Trompillo	1,760	1,800
San Rafael y An., aviada	$620	$650
Soledad, aviada	910	950
Sorpresa, aviada	240	250
MEXICO:		
Aldebarren	33	40
Buen Despacho	42	50
Dos Estrellas	3.575	3 625
La Esperanza (El Orc)	1,500	1,500
Santa Ana, Esperanza	30	60
NUEVO LEON:		
La Fraternal	580	620
Norias de Bajan	700	750
SAN LUIS POTOSI:		
Concepcion y An	20	30
El Barreno, aviadora	103	106
Sta. Maria de la Paz	236	245
ZACATECAS:		
Asturiana y An	8	12
Candelaria y Pinos	110	130
San Carlos y Annexas	15	20
Sta. Maria de Gaud	77	80
MISCELLANEOUS:		
Bartolome de Medina	75	80
Naica (Chihuahua)	11,000	13,000
Natividad (Oaxaca) aviadora	700	750
San Francisco Hac	79	84
Union Hacienda	250	300

LONDON.

Company.	Par Val.	Latest dividend. Amt.	Latest dividend. Date.	June 1. Buyers.	June 1. Sellers.
American:	£ s.	s. d.		£ s. d.	£ s. d.
*Alaska Treadwell	5 0	2 0	Apr., 1905	6 13 9	6 14 3
Anaconda	5 0	2 0	May, 1905	5 6 3	5 8 9
Camp Bird	1 0	9	May, 1905	1 15 0	1 16 3
El Oro	1 0	9	July, 1904	1 3 9	1 6 3
Le Roi	5 0	5 0	Nov., 1899	1 3 9	1 8 3
Le Roi No. 2	5 0	2 0	Jan., 1905	13 9	18 9
Montana	1 0	6	Apr., 1899	9	1 3
Stratton's Independence	1 0	6	May, 1905	10 6	11 0
Tomboy	1 0	1 0	Dec., 1904	1 0 0	1 2 6
Tyee	1 0	2 0	Dec., 1904	1 10 0	1 12 6
Utah Con	1 0	6 0	Jan., 1905	8 15 0	9 0 0
Ymir	1 0	1 0	Mar., 1902	1 3	3 9
European:					
Linares	3 0	5 0	Apr., 1905	4 0 0	4 10 0
*Mason & Barry	1 0	7 0	May, 1905	2 8 9	3 1 3
Rio Tinto	5 0	37 6	Apr., 1905	59 10 6	59 16 0
Rio Tinto, pf	5 0	2 6	Apr., 1905	6 2 6	6 7 6
*Tharsis	2 0	7 0	May, 1905	6 0 0	6 5 0
West Australian:					
Associated	1 0	2 6	July, 1904	1 18 1½	1 19 4½
Golden Horseshoe	5 0	6 0	Apr., 1905	7 1 3	7 5 0
Great Boulder		2	Apr., 1905	1 2 9	1 3 3
Great Boulder Perseverance	1 0	9	Mar., 1905	12 6	1
Great Fingall	1 0	7 6	Apr., 1905	7 13 9	7 16 3
Ivanhoe	5 0	9 0	Apr., 1905	7 16 3	7 18 9
Kalgurli	1 0	2 6	Apr., 1905	7 11 3	7 12 6
Lake View	1 0	1 6	Oct., 1904	1 0 0	1 1 3
Oroya-Brownhill	1 0	4 0	Mar., 1905	3 6 10½	3 8 1½
Miscellaneous					
Broken Hill	8	1 6	May, 1905	2 7 0	2 8 0
Mt. Lyell	3 0	1 3	Dec., 1904	18 0	19 0
Mt. Morgan	1 0	3	May, 1905	2 15 0	2 17 6
Waihi	1 0	2 6	Mar., 1905	6 1 3	6 3 9
Indian:					
Champion Reef	10	1 3	Apr., 1905	1 13 6	1 14 6
Mysore	10	5 6	Mar., 1905	7 0 0	7 1 3
Nundydroog	10	1 6	Mar., 1905	1 1210½	1 13 1½
South African:					
Angelo	1 0	5 0	Feb., 1905	6 1 3	6 3 9
British So. Africa	1 0	rts.	May, 1899	2 0 7	2 1 9
City & Suburban	4 0	6 0	Feb., 1905	5 6 3	5 8 9
Consol. Gold-Fields	1 0	2 6	Dec., 1904	7 12 6	7 13 9
*Crown Reef	1 0	20 0	Apr., 1905	13 0 0	13 10 0
De Beers, preferred	2 10	10 0	Feb., 1905	17 18 0	18 1 3
De Beers, deferred	2 10	2 0	Feb., 1905	17 6 3	17 1 3
East Rand	1 0	4 0	Feb., 1905	7 10 3	8 0 0
Ferreira	1 0	2 0	May, 1905	19 10 0	20 10 0
Geldenhuis	1 0	5 0	Feb., 1905	4 8 9	4 11 3
Geduld	1 0	rts.	Mar., 1902	7 1 3	7 3 9
Henry Nourse	1 0	8 0	Feb., 1905	7 5 0	7 10 0
Knights	1 0			5 1 3	5 3 9
Langlaagte	1 0	2 0	Feb., 1905	3 8 9	3 11 3
Modderfontein	1 0	rts.	Apr., 1902	10 2 6	10 5 0
New Kleinfontein	1 0	rts.	Apr., 1902	2 3 9	2 6 3
New Primrose	1 0	3 0	Feb., 1905	2 10 0	2 12 6
Premier, def		2½ 10 0	June, 1905	14 15 0	15 0 0
Premier, pf		5 5 3	June, 1905	9 1 3	9 3 9
Rand		5 5 0	Aug., 1904	9 16 3	9 18 9
Randfontein	1 0	rts.	Apr., 1899	2 13 9	2 15 0
Robinson	5 0	8 0	Feb., 1905	9 5 0	9 10 0
Robinson Deep	1 0	3 0	Aug., 1904	5 12 6	5 15 0
Rose Deep	1 0	3 0	Feb., 1905	7 10 0	7 17 6
Simmer & Jack	1 0	6	May, 1905	1 13 9	1 16 3
Village Main Reef	1 0	4 0	Jan., 1905	5 10 0	5 15 0
Wemmer	1 0	12 6	Dec., 1904	6 5 0	6 15 0

* Ex-dividend.

LONDON (*By Cable**).

Company.	June 13 £	s.	d.	Company.	June 13 £	s.	d.
Camp Bird	1	14	9	Esperanza	1	7	6
Consolidated Gold Fields	6	15	0	Modderfontein	10	5	0
De Beers	17	0	0	Rand Mines	9	11	3
Dolores	1	9	0	Rio Tinto	61	10	0
East Rand	8	18	9	Simmer & Jack	1	15	0
El Oro	1	1	3	Tomboy	1	0	0

* Furnished by Wm. P. Bonbright & Co., 24 Broad St., New York

PARIS.

Company.	Location.	Par value.	Latest dividend.	June 1. Opening.	June 1. Closing.
		Fr.	Fr.	Fr.	Fr.
Acieries de Creusot	France	2,000	75.00	1,935.00	1,955.00
Anzin, coal	France		290.00	5,845.00	5,845.00
Blache-St. Vaast	France	1,000	160.00	3,605.00	3,605.00
Boleo, copper	Lower Cal.	500	104.17	2,670.00	2,675.00
Bruay, coal	France	400	27.50	794.00	785.00
Courrieres, coal	France	500	110.00	3,149.00	3,125.00
Escombrera-Bleyberg, z.	France	350	35.00	710.00	710.00
Huanchaca, silver	Bolivia	125	2.50	83.50	82.25
Laurium, zinc, lead	Greece	500	25.00	337.00	339.00
Malfidano, zinc	Italy	500	50.00	647.00	648.00
Metaux, Cie. Fran. de	France	500	22.50	558.00	550.00
Mokta-el-Hadid, iron	Algeria	500	40.00	1,030.00	1,049.00
Nickel	N. Caledonia	250	22.50	693.00	710.00
Penarroya, coal	Spain	500	45.00	1,179.00	1,184.00
Vielle Montagne, zinc	Belgium	30	30.00	830.00	825.00

CHEMICALS, MINERALS, RARE EARTHS, ETC.—CURRENT WHOLESALE PRICES.

(See also Market Reviews.)

ABRASIVES—		
Bort as to size	carat	$10.00@$18.00
Carborundum, f.o.b. Niagara Falls, powd	lb.	.08
Grains	"	.10
Corundum, N. C.	"	.07@.10
Chester, Mass.	"	.04½@.05
Craigmont, Ont.	"	.05½@.06½
Mont. f o.b. Chicago	"	.07@.07½
Crushed Steel, f.o b. Pittsburg	"	.05½
Alundum	"	.10
Keg lots	"	.06
Emery, in kegs: Turkish flour	"	.03½
Grains	"	.05@.05½
Naxos flour	"	.03½
Grains	"	.05@.05½
Chester flour	"	.03½
Grains	"	.05@.05½
Peekskill, f.o.b. Easton, Pa., flour	"	.01½
Grains, in kegs	"	.02½
Garnet, per quality	sh ton	25.00@35.00
Pumice Stone, Am. Powd.	lb.	.01 3-5@.02
Italian, powdered	"	.01½@.01½
Lump, per quality	"	.04
Rottenstone, ground	"	.02½@.04½
Lump, per quality	"	.06@.20
Rouge, per quality	"	.10@.30
Steel Emery, f.o.b Pittsburg	"	.07
ACIDS—		
Boracic, crystals	"	.10
Powdered	"	.10½
Carbonic, liquid gas	"	.12½
Hydrofluoric, 30%	"	.03
48%	"	.05
60%	"	.11
ALCOHOL—Grain	gal.	2.38
Refined w. od, 95@97%	"	.70@.75
Purified	"	1.25@1.30
ALUM—Lump	100 lb.	1.75
Ground	"	1.85
ALUMINUM—Sulphate, com'l.	"	75@1.25
AMMONIUM—		
Bromide	lb.	.22
Carbonate	"	.08
Muriate grain	"	.05½@.05½
Lump	"	.09½
ARSENIC—White	"	.02½@.03
Red	"	.06½@.06½
ASPHALTUM—		
Barbadoes	"	.02½@.03
Cuban	"	.01½@.03½
Egyptian, crude	"	.06@.07
Gilsonite, Utah ordinary	"	.03@.03½
Trinidad	"	35.00
BARIUM—		
Carb. Lump, 80@90%	sh ton.	25.00@27.00
92@98%	"	28.00@29.00
Powdered 80@90%	lb.	.01½@.02
Chloride com'l	100 lb	1.35@1.50
Chem. pure cryst	lb.	.05
Nitrite, powdered	"	.05
Sulphate (Blanc Fixe)	"	.02
BARYTES—		
Am. Crude No 1	sh. ton.	9.75
Crude No. 2	"	8.00
Crude No. 3	"	7.00
Floated	"	16.75@18.00
Foreign floated	"	18.75@20.50
Snow-white	"	17.25@18.75
BAUXITE—Ga. or Ala. Mines:		
First grade	lg. ton.	5.25@5.50
Second grade	"	4.50@4.75
Arkansas, first grade	"	5 00@5.50
Second grade	"	4.50@4.75
Washed ore	"	6 00@7.00
BONE ASH	100 lb.	.02½@.02½
BORAX	"	.07½@.07½
CADMIUM—Metallic	"	1.40
CALCIUM—Acetate, gray	"	2.30
Acetate, brown	"	1.55
Carbide, ton lots f.o.b. Niagara Falls, N. Y., for Jersey City, N. J.	sh. ton.	65.00
Chloride, f o.b. works	"	9.00@10.00
CEMENT—		
Portland, Am. 400 lb.	bbl.	.90@1.25
Foreign	"	1.25@1.75
"Rosendale," 300 lb.	"	.80
Slag cement	"	.75@1.25
CHLORINE—Liquid		.30
Water		.10
CHROME ORE—		
(50%) ex-ship N. Y.	lg. ton.	18.50@19.00
Bricks, f.o.b. Pittsburg, M.	"	175.00
CLAY, CHINA—Am. common ex-dock, N. Y.	"	7.75@8.00
Am. best ex-dock, N. Y.	"	9.00@9.25
English, common	"	11.00@11.25
Best	"	16.75
COPPERAS—Bulk	100 lb.	$0.47½
In bbls	"	.52½
CRYOLITE	lb.	.06½
EXPLOSIVES—		
Blasting powder, A	25-lb. keg	.65
Blasting powder, B	"	1.40
"Rackarock," A	lb.	.25
"Rackarock," B	"	.18
Judson R.R. powder	"	.10
Dynamite (20% nitro-glycerine)	"	.13
(30% nitro-glycerine)	"	.14
(40% nitro-glycerine)	"	.15
(50% nitro-glycerine)	"	.16½
(60% nitro-glycerine)	"	.18
(75% nitro-glycerine)	"	.21
Glycerine for nitro	"	.11@.11½
FELDSPAR—Ground	sh ton.	9.75@10.00
FLUORSPAR—		
Domestic f.o.b. shipping port:		
Lump	sh. ton.	8.00@10.00
Ground	"	11.50@13.50
Gravel	"	4.25@4.50
FULLER'S EARTH—Lump	100 lb.	.80
Powdered	"	.85
GRAPHITE—		
Am. pulverized	"	45.00
Best flake	"	150.00
Ceylon, common pulv	"	.02¾@.03½
Best, pulverized	"	.04@.08
German, com. pulv	"	.01½@.01½
Best, pulverized	"	.01½@.02
Italian, pulverized	"	.01½
GYPSUM—Ground	sh. ton.	8.00@8.50
Fertilizer	"	7.00
Rock	g. ton.	4.00
English and French	"	14.00@16.00
INFUSORIAL EARTH—		
Ground Am. best	"	20.00
French	"	37.50
German	"	40.00
LEAD—Acetate, white	lb.	.09@.09½
Brown	"	.07@.07½
Nitrate, com'l	"	.06½
" granular	"	.08½
MAGNESITE—Greece.		
Crude (95%)	lg. ton.	6.50@7.00
Calcined	sh. ton.	16.50@17.00
Bricks, domes, per qual. f.o.b. Pittsburg	M.	160@200
MAGNESIUM—		
Chloride, com'l	lb.	.01¾
Sulphate	100 lb.	.50@1.25
MANGANESE—		
Crude powdered:		
70@75% binoxide	lb.	.01½@.01½
75@85% binoxide	"	.01½@.02½
85@90% binoxide	"	.02½@.03½
90@95% binoxide	"	.03½@.05½
Ore	unit.	.18@.20
MARBLE—Flour	sh. ton.	6.00@7.00
MINERAL WOOL—		
Slag, ordinary	"	19.00
Selected	"	25.00
Rock, ordinary	"	32.00
Selected	"	40.00
OZOKERITE	lb.	11½
PAINTS AND COLORS—		
Litharge, Am. powdered	"	.05½@.06½
English glassmakers'	"	.08½@.08½
Lithophone	"	.03½@.06½
Metallic, brown	sh. ton.	19.00
Red	"	16.00
Ocher, Am. common	"	8.50@9.00
Best	"	16.00
Dutch, washed	lb.	.02½
French, washed	"	.01½@.01½
Paris green, pure, bulk	"	.12
Red lead, American	"	.06½@.06½
Foreign	"	.07@.08½
Turpentine, spirits	gal.	.64
White lead, Am., dry	lb.	.05½@.05½
American, in oil	"	.06½@.06½
Foreign, in oil	"	.09@.09½
Zinc white, Am. extra dry	"	.04½@.04½
Foreign, red seal, dry	"	.06@.08½
Green seal, dry	"	.06½@.09½
POTASSIUM—		
Bicarbonate crystal	lb.	$0 08½
Powdered or granulated	"	.14
Bichromate, Am.	"	.08½@.084
Scotch	"	.08½@.08¾
Bromide	"	.15
Carbonate (80@85%)	"	3.50@4.00
Caustic, ordinary	"	.04½
Elect. (90%)	"	.06½
Chlorate, powder d	"	.08½@.08½
Crystals	"	.08½@.08½
Cyanide (98@99%)	"	.18@.19
Kainit (bulk)	g. ton.	8.50
Manure salt 20%	"	14.75@15.75
Double Manure Salt, 48@53%	100 lb.	1.16½@1.19½
Muriate	"	1.90@1.95
Permanganate	lb.	.09½@.09½
Prussiate, yellow	"	.13½@.13½
Red	"	.35
Sulphate	100 lb.	2.18½@2.21½
SALT—N. Y. com. fine 280 lb. bbl.		.72@1.18
N. Y. agricultural	sh. ton.	4.40
SALTPETER—Crude	100 lb.	4.00@4.25
Refined	"	4.25@4.75
SILICA—		
Ground quartz, ord'ry	sh. ton	9.00@10.00
Best	"	12.00@13.00
Lump Quartz	"	2.50@4.00
Glass sand	"	2.75
SILVER—Nitrate, crystals	oz.	.36½
SODIUM—		
Bicarb., ord., bulk, f.o.b. works	100 lb.	1.30
Extra domes, f.o.b. works	"	3.50
Bichromate	lb.	.06½
Bromide	"	.20
Carbonated ash, high test, in bags, f.o.b., works	100 lb.	.75@.77½
Foreign, f.o.b. N. Y.	"	.85@.87½
Caustic, 60@78%, f o b., works	"	1.75@1.85
Foreign, f.o.b. N. Y.	"	1.90@1.95
Chlorate, com'l	"	.08½@.08½
Hyposulphite, Am.	"	1.50@1.60
German	"	1.75@2.00
Phosphate	lb.	.02½@.02½
Prussiate	"	.09½@.09½
Sal soda, f.o.b works	100 lb.	.60
Foreign, f.o.b. N. Y.	"	.85
Silicate, concentrated	lb.	.05
Com'l	"	.01
Sulphate, com'l	100 lb.	.65
SULPHUR—Best seconds, per ton,		21.00
Roll	lb.	1.85
Flour	"	1.90
Flowers, sublimed	"	2.20
TALC—North Carolina	sh. ton.	15.50@23.50
N Y Fibrous best	"	10.25
French, best	"	20.00
Italian, best	"	30.00
TAR—Oil bbl. (50 gal.)	bbl.	5.40
TIN—Crystals	lb.	.22
URANIUM—Oxide	"	2.25@3.00
ZINC—Metallic ch. pure	"	.07@.09½
Chloride solution, com'l	"	.02½
Chloride, granular	"	.04½@.04½
Dust	"	.05½@.05½
Sulphate	"	.02@.02½

The Rare Earths.

BORON—Nitrate	lb.	$1.50
CERIUM—Nitrate	"	12.00
DIDYMIUM—Nitrate	"	45.00
ERBIUM—Nitrate	"	67.50
GLUCINUM—Nitrate	"	13.50
LANTHANUM—Nitrate	"	56.00
LITHIUM—Carbonate	"	1.50
LITHIUM—Nitrate	oz.	.60
STRONTIUM—Nitrate	lb.	.07@.07½
THORIUM—Nit. 49@50%	"	4.50
URANIUM—Nitrate	oz.	.25
ZIRCONIUM—Nitrate	lb.	10.00

Note—These quotations are for wholesale lots in New York, unless otherwise specified, and are generally subject to the usual trade discounts. Readers of THE ENGINEERING AND MINING JOURNAL are requested to report any corrections needed, or to suggest additions which they may consider advisable.

THE ENGINEERING AND MINING JOURNAL

The Atom.

BY CHARLES S. PALMER.

The word 'atom' was formed from two Greek words, and it originally meant 'uncut,' in the sense of uncutable or indivisible. The term as so used was applied by a school of philosophers who believed that, in the subdivision of matter, a point is reached beyond which it is practically impossible to go. The little pieces at this limit were therefore called 'atoms' or 'uncutables.' In the process of time, chemistry grew up; in developing the modern theory of discrete particles of matter, chemical nomenclature unfortunately settled upon the word 'atom' as the general name for these units. The fundamental conception of the modern chemical atom is that of a small numerical combining weight, in ratio with the combining weights of other elements, respectively. It has been frequently remarked that these atoms are small round bodies. Small they certainly are; round they may be, but that is a theoretical matter, and secondary as compared with the conception that grew up insensibly about these atoms. Organic chemistry showed their grouping in exquisite structure, gave them properties of valence, and almost explained their action. Physical chemistry gave them other properties, assigned electrical charges, and clothed them with such individuality that chemists were in a fair way of forgetting the meaning of the word atom.

The classical significance of 'uncutable' ought to have been adopted by chemists only in the restricted sense of 'uncut up to date.' The very spirit of agnosticism should have urged this conservative decision. Moreover, there are many reasons why the modern chemical atom should never have been regarded as 'uncutable,' but only 'uncut up to date.' The various allotropic states of the same element, the various crystalline forms, the various specific gravities—these are not the ear-marks of simple things. Moreover, the change of valence of most elements, the very fact of poly-valent quality, the multiplicity of lines in a spectrum of one element (iron has thousands of lines, hydrogen has several dozen)—all this spelled only one thing, that was complexity. But it is a canon in science not to look for new and troublesome hypotheses, till trouble comes; and so it is only recently that the real permanent individuality of the atom has been assailed.

Lockyer maintained, years ago, that most elements were dissociated into simpler units in the hot stars. His proof was faulty, but apparently his vision was clear. The orthodox grouping of the periodic sequence for a long time has shown too many gaps and too long ones. Helium and argon and their tribe came to found a new class. The electron, or corpuscle, more properly (because the use of the former word might suggest positive electrons, and such have not been found) came next, and this is under certain conditions a part of an atom, its negative charge, in fact. Then radium came in; and, while it is frequently the case that scientists go crazy for a while over a new symbolic fad, as they did years ago over radicals and valence, and as they are doing now over radium and corpuscles, still there must be a modicum of truth in the picture of atomic collision and bombardment with which we are treated in every issue of our scientific press. The atom is figuring now as a poor weather-beaten residue of this atomic and sub-atomic clash and erosion. Not an 'uncutable' thing, not even 'uncut up to date,' in short, not *a*-toms but *'toms*, something 'cutable,' perishable, transient. Given the conception of the time period for the disintegration of radium as a new physical constant to be determined, and Prospero's dream of destruction may apply also to the other elements.

The truth is always between the extremes, but R. J. Strutt recently ventured the view that thorium may decompose into uranium and helium. Offhand, this would seem to be bad atomic fractioning; for the accepted atomic weight of uranium is greater than that of thorium, and it would be a case of leaving a chip that is greater than the original log. But the fact is that atomic disintegration is in the air. Meanwhile, this will not seriously affect the price of copper or steel, for atomic disintegration that can be measured is the exception, and is minute to a degree in terms of mass. The really suggestive part of the new hypothesis of atomic decay and erosion (which has not yet been proved for any element but radium, and hardly even for that) is that matter in the infinitesimal state is still matter. We knew the atom has weight; we learned that it has position, and takes up room; the tetrahedron theory of carbon in metameric organic compounds taught us that. Now we learn another of its likenesses to gross matter. Atoms can wear out. That is satisfactory. Perhaps the microcosm differs not from the macrocosm; and the atom may be only a solar star of a lesser grade, built in complexity, equipped with satellites, and enjoying its cycle of growth, maturity and decay. Certainly the atom concept loses not a whit of interest by the trend of fresh discovery.

Among other uses, the Cooper Hewitt mercury-vapor lamp has been used in taking a series of moving-pictures of the New York subway.

The ingredient 'martensite' of steel, though detected and identified by the microscope, has never been isolated. It seems to be a specialized interlacing of ferrite and cementite.

Coal Tests at St. Louis.

The United States Geological Survey is presenting an opportunity to coal producers to co-operate in its work of testing the coals and lignites of the United States. This work was begun at the World's Fair grounds, St. Louis, during the exposition and will be continued along the lines laid down at that time. The survey is desirous of securing from operators and others interested in the problems of fuel consumption an expression of opinion as to whether they desire to co-operate in this work. Offers of coal for testing purposes should be addressed to the Director of the United States Geological Survey, Washington, D. C.

It is not possible to promise at the present time that all offers of coal will be accepted, but the plan is to make the investigation as complete as practicable, distributing the work as impartially as possible over the entire country. The distribution of the work will depend largely upon the replies received to the circular which the Survey is now sending out to coal operators, and upon the present and possible future development of the coal and lignite deposits of the several States.

Arrangements have been made with the manufacturers of the equipment used during the exposition to have practically all of this testing machinery left at the disposal of the Government. In offering coal for testing purposes, operators are requested to note the following conditions with which it is necessary to comply:

1. The coal must be furnished to the testing plant free of cost to the Government.

2. The coal must be loaded under the supervision of one of the inspectors employed for that purpose, who shall be at the same time allowed to visit the working places in the mine to procure samples for analysis.

3. When it is possible to do so, the coal should be loaded in box cars and shipped under seal. Lignites must always be shipped in this way.

4. Where the market requires screened coal, this grade will be accepted for test. The selection of coal is always to be under the direct control of the representative of the testing plant.

5. Where one of the problems involved is the better utilization of slack coal, a carload of slack may be accepted for testing purposes.

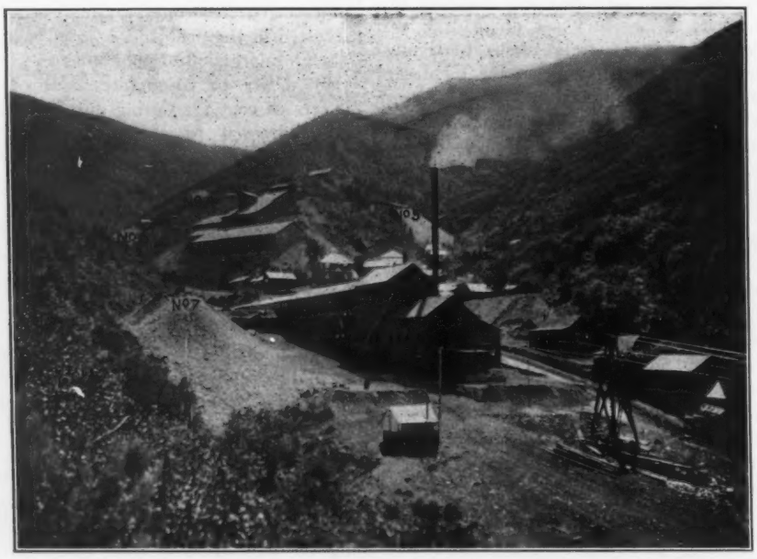
6. As soon as possible after the tests are completed, a brief statement of the results will be furnished to parties supplying the coal, for their information, but this must not be made public until the results are published by the Geological Survey.

7. Everyone interested in any particular test or in the general operation of the plant is invited to be present at any time, but the official record of the test will not be given out, except as indicated in the preceding paragraph.

Ore Deposits of Bingham, Utah.*

BY J. M. BOUTWELL.

Bingham is the leading copper-producing camp in Utah. It is also the oldest mining district in the State, and the only one in which placer mining has been profitably conducted. The present output is composed almost entirely of low-grade pyritous copper-sulphide ore, with comparatively small amounts of enriched high-grade black copper-sulphide ore, and of rich argentiferous lead ore. The annual output, as reported for 1904, is nearly a million tons of ore. The total output, 1870-1904 inclusive, is valued at $40,000,000.



HIGHLAND BOY MINE.

This district is situated in the north-central part of Utah, on the rugged eastern slopes of the Oquirrh mountains, 20 miles southwest of Salt Lake City. The productive region proper, occupied by about 125 properties, embraces an area of about 15 square miles, but the five great properties which produce the bulk of the present output lie within a single square mile. The town, including the principal settlement scattered along the bottom of Lower Bingham cañon and several smaller settlements which have grown up about the larger mines, has a population of 2,000. Railway connection with the Rio Grande Western main line is afforded by a branch line, 14 miles in length, that extends from Bingham to Bingham Junction, 11 miles south of Salt Lake City. Two aerial tramways, 2⅓ and 3⅓ miles long, from the two largest producing mines, and a standard-gauge railroad from the other more important producers, connect the principal mines with this Bingham branch. Ample facilities are thus afforded for bringing in supplies, and for shipping out ore. Since the exhaustion of the heavy forests which originally covered the mountains, coal has thus been brought in, at reasonable rates. Water is scarce; the chief source is the outflow from mine workings. The largest amount for any single purpose is used in a large concentration mill, and this is obtained partly from a deep shaft in the creek-gravel, but mainly from a spring 12 miles to the north. Ample labor, largely foreign, is secured at moderate prices. Costs of mining and smelting compare favorably with those in other Western copper districts.

During its eventful history Bingham has experienced an unusual succession of activities; these explain its general reputation for steady production and its recent phenomenal growth. Originally staked out for lead and copper mining, the camp subsequently attracted attention by a production of placer gold, amounting to about $1,500,000; then, at successively later epochs, it yielded carbonate and sulphide argentiferous-lead ores, oxidized gold ore, sulphide argentiferous-lead ore, and finally, during the last decade, a rapidly increasing production of copper ore.

This product is supplied by a few large consolidated properties, including the Utah Consolidated Company, operating the Highland Boy mine; the U. S. Mining Company, operating the Old Telegraph and Old Jordan mines; the Bingham Gold and Copper Company, operating the Commercial, Dalton-Lark and Brooklyn mines; the Boston Consolidated Company, operating the Old Stewart mine; the Yampa Consolidated, working the Yampa mine; and the Utah Copper Company, operating the Wall property. Each of these companies, with one exception, has erected extensive modern plants, especially designed for the reduction of its own output. True pyrite smelting is not attempted, but the sulphur of these highly pyritic ores is largely utilized. Six private plants have been built, including the Highland Boy smelter, of 750 tons daily capacity, at Murray; the U. S. smelter and the Bingham Gold and Copper smelter, of 1,000 and 500 tons capacity, respectively, at Bingham Junction; the Yampa smelter, of 600 tons capacity, and the Utah concentrator, 500 tons capacity, in Lower Bingham cañon. In 1902, a 1,000-ton smelter for reducing argentiferous lead ores was

FACE OF RICH BLACK SULPHIDE COPPER ORE.—GRECIAN BEND LEVEL, TELEGRAPH MINE.

*This condensed statement is published with the permission of the Director of the U. S. Geological Survey. The complete report is now in press and will appear shortly as Professional Paper No. 38, U. S. Geological Survey. Copies may be obtained free of charge upon request to the Director U. S. Geological Survey, Washington, D. C.

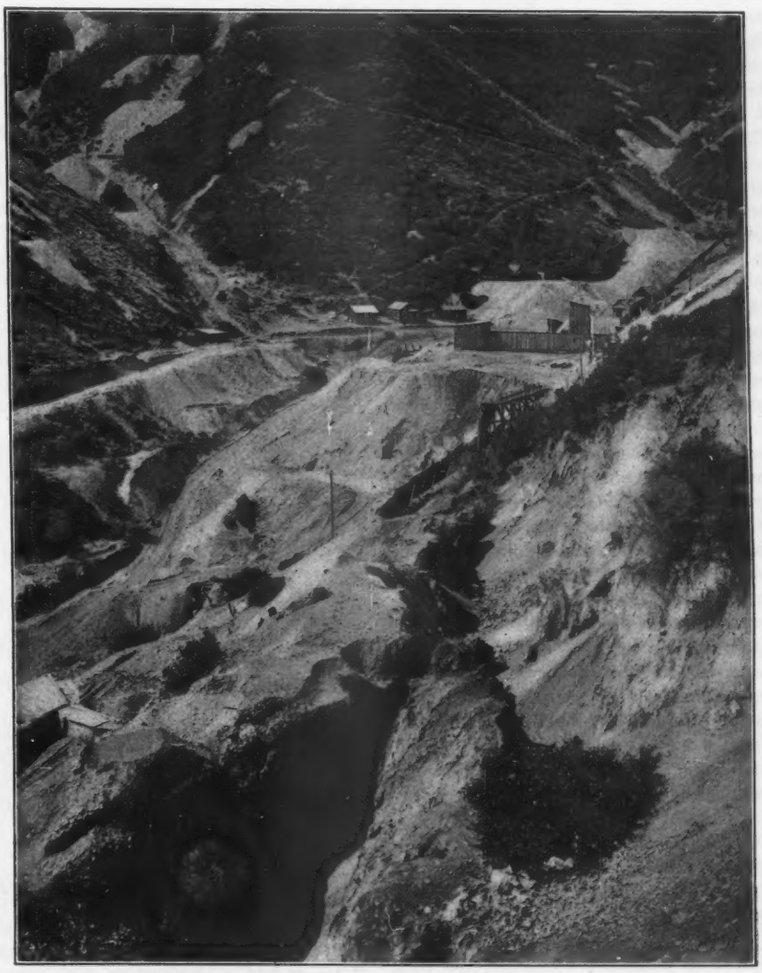
completed at Murray by the American Smelting & Refining Company; and low-grade ores, chiefly of lead, are concentrated at several custom mills in Bingham cañon. Other noteworthy properties now in operation are the Ohio Company, operating the Columbia and Erie mines, the Neptune and Kempton, Silver Shield, Nast, Last Chance, Butler-Liberal, Petro, Utah-Apex, New Haven Copper and Gold, and Fortuna.

Underground development, considering the age and production of the camp, though extensive, is shallow, and the returns have been won at a comparatively low cost of development. Sinking has proceeded below the level of surface-water in only three or four properties, so that, with these few exceptions, problems of mine drainage have not as yet been serious. Development work has never been carried deep, so that the persistence of pay ore to great depth has not yet been demonstrated.

Geology.—This region has been the center of a complex succession of activities which culminated in ore deposition. The sedimentary section embraces several thousand feet of massive quartzite, with a few relatively thin beds of limestone intercalated in the lower half, and black calcareous carbonaceous shales, sandstones and impure limestones, in the upper half. Faunas from these intercalated members prove the age of the sediments to be Carboniferous. The limestones of the lower portion, averaging 200 ft. thick, have been highly marbleized and form the country rock for all the large bodies of copper ore. The calcareous carbonaceous shales of the upper part, sometimes several hundred feet thick, also favor ore deposition. In general, the sediments throughout this region dip northward and strike northeast and southwest. This strike is not constant, however, but turns gradually from an east-west course on the western slope of the range to a north-south trend on the eastern. The area occupied by this district thus lies in a shallow flaring trough or synclinal basin that pitches northward.

This general succession and structure has been interrupted, particularly in the geologically lower portion, by many irregular dikes and sills of monzonite porphyry, by laccolithic masses of monzonite, and by several systems of persistent fissures. Two extensive areas of monzonite occur in the center of the camp, one in the form of an irregular laccolith, the other in the form of a broad, irregular stock. The porphyry dikes and sills adjoin these masses on the east and west. An extensive body of latite, outcropping along the eastern slope of the range, is a flow which buries an old topography carved in the sediments, and probably also in the intrusives.

After the epoch of igneous intrusion, intense fracturing and fissuring occurred throughout the district at several periods. Dominant fissures and fracture-zones, which include the principal bodies of lead and silver ore, trend northeast and southwest; distinctly later ones, which fault the ore, trend northwest and southeast. Numerous minor features follow intermediate courses, and movement has recurred in a northeast-southwest direction. The displacements produced are frequently of a complex nature, but rarely exceed 150 ft., and are usually considerably less. In brief, sedimentary country rock, which consists of Carboniferous quartzite, including limestone and calcareous shale, has suffered extensive intrusion, thorough contact metamorphism, intense fissuring and partial burial beneath a latite flow.



SURFACE WORKINGS ON GALENA FISSURE.—OLD JORDAN MINE.

Occurrence of the Ore.—The productive area is limited to a region characterized by intrusives. Within this area the largest orebodies occur in metamorphosed limestone adjacent to intrusives and to fissures. Outside of this comparatively small area orebodies have not been found.

The copper ore occurs in large masses in limestone and also in minute grains disseminated through monzonite. The large bodies lie within massive marbleized limestone adjacent to intrusives and to fissures. They are in the form of beds, lying roughly parallel with the bedding of the country rock, and exhibit a massive banded structure. These irregular beds of ore are localized into elongated lenticular shoots, which dip roughly with the bedding and pitch moderately. The shoots sometimes assume great size, being several hundred feet along their strike, nearly 200 ft. thick, and have been followed downward continuously for several hundred feet.

The large ore-shoots which have been opened in Highland Boy ground, through a series of seven strike-adits, are excellent examples of this class of deposits. The No. 1 shoot in this mine is not only the largest orebody known in Bingham, but it is one of, if not the largest, in the world proved to have been formed by replacement. Other valuable bodies which exhibit the same general characteristics have been developed in the Telegraph, Old Jordan, Commercial, Boston Consolidated, and Yampa mines.

The copper ore which occurs in intrusives is disseminated throughout a large laccolith of monzonite, especially in those areas in which the country rock is fractured, fissured and altered. Irregu-

lar grains of chalcopyrite and cupriferous pyrite are there found in small veinlets along joint or fracture-planes, and less abundantly in altered areas immediately adjacent to such planes. This ore is now mined and concentrated on a large scale by the Utah Copper Company.

The argentiferous-lead ore occurs in single and composite veins throughout the camp, but more frequently in the vicinity of intrusives. They traverse all kinds of rock known in the district. The veins are widest in limestone and next in shales, which contain calcareous and carbonaceous matter. Of those observed, over 84% trend northeast-southwest, and over 90% dip to the northwest. The Galena fissure, which has been more extensively opened than any other, is known for about 3,500 ft. horizontally and about 700 ft. in depth. The Eagle Bird fissure in Butterfield ground has been followed continuously downward on a steep dip about 800 ft. Among the veins which have yielded a valuable output are the Winamuck, Robbie, Silver Shield, Nast, Last Chance, Erie and Montezuma.

Character of the Ore.—Nearly all of the present output is derived from the bedded ore in limestone. This is made up of copper sulphide ore, in which the primary sulphides, massive chalcopyrite and pyrite predominate. Those portions which have been most exposed to superficial alteration, however, afford enriched sulphide ore containing chalcocite, tetrahedrite and tenorite. In some of these tellurium is associated with the black sulphide, in one instance in considerable amount with largely increased value in gold and silver. Other copper minerals occurring in Bingham are bornite, binnite, cubanite, enargite, tennantite, bournonite, covellite, cuprite, malachite, azurite, chalcanthite, pisanite and native copper. Quartz is the principal gangue material of the sulphide copper ore, and garnet, epidote, tremolite, specularite, pyrrhotite, sphalerite, etc., are associated in small amounts.

The copper content in the average sulphide ore is low, ranging from 2.5 to 5%, with an approximate mean of 3.5 to 4%. The accessory gold, averaging from 10c. to a dollar per ton, and silver averaging from 2 to 5 oz. per ton, raise the total value of this ore to a price ranging from $11 to $15 per ton. For ore of this class 3% copper is about the lowest content which will allow mining and smelting at a profit. Samples of enriched black sulphide ore give a high copper content, largely increased amounts of gold and silver, and some tellurium. It is thus probable that a portion, at least, of the precious metals occurs as tellurides.

The auriferous copper milling-ore from the monzonite is chiefly composed of chalcopyrite and pyrite, with a little bornite and magnetite, and a highly silicious gangue. Its average value has been determined to be about 1.5% copper. On concentration by the usual wet methods, about 20 into 1, it is reported to yield 33 to 35% copper, $5 in gold and a small amount of silver.

The prevailing lead-bearing mineral in the fissure ores is galena; small amounts of cerussite, anglesite and massicot are also present. The silver in these ores has been found to lie in considerable quantity in gray copper (freibergite), and it also doubtless occurs in galena and pyrite. Pyrargyrite and cerargyrite have been reported. Some silver appears to occur as a telluride. The common gangue of the fissure ores is quartz, calcite and sphalerite, with a little barite and rhodochrosite. The average content of the fissure ores is approximately 45% lead, 65 oz. silver, small amounts of gold and copper, and zinc. Accessory gold, probably in pyrite, ranges in the copper ores in limestone from 80c. to $2.20; in lode ores 50c. and $2.50, and in the milling ores from monzonite it averages about 30c. per ton. The zinc, which is a constant associate in the lode ores, is usually in the form of blende (sphalerite). It ranges from a trace to 45%, and averages 10 to 15%. As yet no satisfactory means for saving this valuable content has been found, although no thorough systematic attempts, commensurate with the importance of the problem, are known to have been made.

Genesis of the Ore.—The character and occurrence of ores afford a strong body of evidence upon the probable genesis of these deposits. It appears that, between Carboniferous and late Tertiary time, monzonitic intrusives invaded sediments in the Bingham area, metamorphosed them, and introduced metallic elements which replaced marbleized limestone with pyritous copper sulphide. After the superficial portions of the intrusives had cooled to at least partial rigidity, they and the inclosing sediments were rent by persistent northeast-southwest (and some east-west) fissures. Heated aqueous solutions from the deeper unconsolidated portions of the magma then ascended these channels, altered their walls, and introduced additional metallic elements. At this time more pyritous copper sulphide may have been added to that formed in the limestone earlier in connection with contact metamorphism. Monzonite, including its original metallic constituents, was altered; copper, gold and sulphur were probably added, and auriferous copper sulphides were formed. The silver-lead ore was deposited in the northeast-southwest fissures, mainly by filling, partly by replacement. Since this second period of mineralization these original ores have been altered by surface waters, in their upper portions into carbonates and oxides, and relatively enriched in their underlying portions through replacement by black copper sulphide with additional gold and silver, probably as telluride.

Conclusions.—As to the future, geological indications and recent developments are favorable to the mining industry of this district. Geological criteria indicate that although the camp has been pretty thoroughly prospected, certain pieces of ground within the known productive area that still remain unexplored are extremely promising. It is thus reasonable to expect that new shoots of valuable copper sulphide ore will be found in the great limestones in certain localities, and that new lodes of rich argentiferous lead ore will be found in the composite country rock about the head of Bingham cañon, and in, or adjacent to, the calcareous carbonaceous shale northwest of Bingham cañon and Carr Fork. Furthermore, recent mining development has increased the known resources of two types of copper deposits: First, the proof of the continuation in depth of the great ore-shoot in the Highland Boy mine, and the proved maintenance of its copper value above the commercial limit, give a reasonable expectation that similar ore-shoots may be followed with profit in other mines; second, the demonstration by the Utah Copper Company that the low-grade auriferous copper ore disseminated in the monzonite can be worked at a saving, opens the field for profitable exploration of other large bodies of mineralized monzonite in this district. These facts indicate a probable regular increase in the output in the immediate future, and thus continued prosperity of the mining industry of Bingham.

A worthy illustration of the use of reinforced cement is the construction of the five-span bridge at Grand Rapids, Michigan.

The receipt for a concrete recently used in building construction was: One part cement, two parts sand, and four parts crushed boulders. The mixture was made so that it could almost be poured into place, being called 'wet concrete.'

The immense heaps of calcium sulphate found about many of the English chemical works, according to a clipping (borrowed, probably, from the *Cement Age*) are to be made into a patent white cement with a smooth glass-like surface and sufficiently porous to take paint. It is possible that the heaps of 'sulphate of lime' referred to are the partially oxidized deposits of calcium sulphide, the 'alkali waste' of the old Leblanc process for making soda. These heaps have been not only a source of loss (as they carry practically all the sulphur that originally entered the process as sulphuric acid, and to recover which has been the object of much inventive attempt that has been almost, but not quite, feasible commercially), but they have also been a nuisance. That they are partially (and externally) oxidized to calcium sulphate is probable, but it is a query worth noting to ask whether they are sufficiently free from the original sulphide to form a permanent cement.

The Origin and Classification of Placers—II.

BY H. L. SMYTH.

Subterranean decay does not divide hard minerals from soft, or light from heavy, and its products necessarily remain in close contact. But with exposure at the surface, or even some distance below it, the physical partings begin to be effected—that is to say, the rocks begin to disintegrate.

The most important of the familiar agents of disintegration are rapid change of temperature through a considerable range, from heat to cold, or the reverse, and also prolonged extremes of temperature. Through differential expansion or contraction the surface rock may be peeled off in layers from exposed ledges, and in time even the smaller fragments may be racked to pieces and finally reduced to dust. The sun's direct rays, the cold of night or winter, act on fresh and decayed rocks alike, so long as they are unprotected by vegetation. Their effects are especially conspicuous in high mountain and desert regions, and in the frozen north, where the rocks are little affected by chemical change.

Beneath the surface, as well as upon it, rocks in mass, in large fragments or in the smallest particles, may be wedged apart by expansion of freezing water, and by the slow growth of the roots of plants. Burrowing animals, from the ant and earthworm to the fox, do similar work in the soft decayed rocks.

By these actions the larger masses are broken into many smaller, and the different minerals of composite substances tend to fall apart. The fragments are no sooner formed at the surface than they begin to separate under the action of gravity and of the rain and winds. The rapidity with which the separation proceeds depends upon the slope, and upon the presence or absence of a protecting mat of vegetation. On the steepest slopes no fragments remain; but as soon as they come into existence, all are carried down by their own weight to the talus heap below. On medium slopes, smaller and lighter particles are washed or blown away, leaving the larger and heavier unmoved or lagging behind. From slopes of gentle inclination, water can carry off the finest and lightest particles only. Where, however, the surface is screened by a continuous and perennial layer of sod or tundra, or a mat of decayed leaves or vegetable mold, relative movement of the particles is impossible, and no separation takes place.

In its broadest aspect the surface of the land may be conceived as consisting of a series of ramifying valleys or lowlands separated by dividing uplands, whether ridges or elevations of ill-defined form. In the upland regions the land is wearing away, and the denuded products are in movement into the lowland areas, and thence finally to the sea. While, however, the divides are constantly being cut down, that is by no means always the case with the lowlands. In these the material in process of transfer may temporarily accumulate, and the surface may be building up or aggrading instead of being worn away. This general travel of rock fragments from highland to lowland, which is effected by rills and sheets of storm-water, by the winds and by gravity, as well as by tributary streams, has the following important consequence: the aggrading lowlands are always covered with a loose mantle, mainly of foreign derivation; the unconsolidated materials that may cover intermediate slopes, if not too steep, are also in large part foreign; while only the uplands that have supplied these materials may have a covering (with the exception of the finest dust) exclusively autochthonous.

It is the upland areas, therefore, that are the peculiar home of the residual placers; that is to say, the unconsolidated deposits, in which valuable minerals in relatively large or heavy particles have been concentrated with little or no lateral travel, by the washing or blowing away of their lighter associates. Suppose a thoroughly decayed rock containing metallic particles—a residual clay disintegrated at the surface—to be exposed to rain and wind unprotected by vegetation. On the gentler slopes the storm-water will be able to move only the lightest and smallest particles, as will the winds when the surface is dry. The larger and heavier will then remain, and as the surface slowly goes down through the secular summation of these minute losses, the metallic minerals and larger fragments may accumulate to an important degree, and, finally, may even constitute a pavement over the decayed rock, in a measure protecting it from further wear. Therefore, to the formation of the residual placer it is necessary that the area should be losing from wear of the actual surface; its valuable particles are not rounded by abrasion; the concentration is superficial, the richest part being at or close to the actual surface; the concentrated layer rests on the parent material; and when the metallic particles are so abundant as to be closely packed, the growth of the layer of enrichment is greatly retarded or practically ceases.

These characters may be seen whenever a bare surface of appropriate material is exposed to the elements. In the Piedmont region of the South, surface concentrations of quartz and impure limonite are common, and, indeed, occasionally adversely affect the fertility of the soil. Of such occurrences Shaler[1] says:

"It sometimes happens that the barren waste from vanished strata is inherited in such quantities upon the present surface . . . that the soil has its fertility more or less impaired. The rocks which are now supplying newly made mineral waste may themselves be of an enriching quality, but the plants are embarrassed by the amount of pebbles through which they have to pass to gain the nutritious material at a lower level."

One of the best examples of a residual placer is the mantle of iron-ore detritus that formerly covered the decomposed porphyry of Iron Mountain in Missouri. The locality is especially instructive because it also contains an ancient stream placer, as well as stratified marine deposits, all fed from the same source. It is to the discriminating observation and clear description of Pumpelly[2] that we owe our knowledge of these occurrences. He says:

"The formation of residuary deposits of iron ore, having their origin in the removal of very resisting crystalline rocks, . . . is well illustrated in the surface ore at Iron Mountain. . . . This hill, which rises 250 ft. above its base, is wholly covered by a mantle of ore detritus, associated with some clay. . . . In all the excavations the porphyry is decomposed, generally to a clay. At the summit an immense mass of solid ore is exposed, while the decomposed porphyry adjoining is traversed in all directions by veins of all sizes and of the most irregular shapes, forming a reticulated network of ore and rock. The surface of Iron Mountain when discovered was covered with a layer from four to twenty or more feet thick, of pure ore, associated with ore-pebbles and ore-sand, and but little clay. . . . The present mantle of ore-detritus represents only a portion of the concentration caused by the removal of the porphyry, for the excavations at the base of the hill show heavy stratified deposits of detrital ore, having exactly the same origin and which was washed down the slope and concentrated by the waves of the Silurian ocean. . . . The instance of Iron Mountain is an extreme case, where the decomposition of the porphyry in mass facilitated the separation of the ore from the rock and the mechanical removal of the latter."

At Iron Mountain, therefore, the heavy and inert iron ore has been separated by disintegration, following long-continued decay, from the light and soluble porphyry, and by the erosion of the latter, a concentration of iron-ore fragments has been brought about at the surface. These fragments formed a pavement, as it were, over the porphyry which, though decayed, was physically intact.

On the unaccented desert upland of Western Australia, residual placers containing gold have been formed mainly by the action of the winds, and in these surface concentration is the conspicuous

[1] N. S. Shaler, 12th Ann. Rept. U. S. Geol. Survey, p. 304.

[2] 'Geol. Survey of Missouri,' 1872, pp. 10-12; *Bull.* Geol. Soc. Amer., Vol. II, pp. 219-221.

feature. Of these deposits, Rickard[3] says: "Gold is found lying on the very top of the ground. The search for the particles of gold scattered over the surface is called 'specking.' In the early days hundreds of ounces were thus picked up in a few hours by the men first to reach a rich spot. When the cream has thus been skimmed off, the sandy soil underneath is treated. . . . After that actual digging begins, the shallow deposits being trenched and pitted in the search for those patches of rich ground through which the gold is found sporadically distributed. 'Specking' is still a recognized occupation on Sundays, even at the established mining centers. I have seen as many as a hundred men walking about with their hands in their pockets and their eyes intent on the ground, for all the world as if they were in disgrace. A 5-oz. nugget may be found, and every one hastens to the spot."

In the same region numerous surface accumulations of iron-ore fragments, and of masses of quartz, due to the removal of the accompanying smaller light particles by the wind, are additional illustrations of this type of concentration. Certain gold placers, mentioned by Posepny,[4] in the Ural and in Bohemia, are of the same type.

In passing from the upland to the valley the moving stream of material, as has already been said, is carried down the intermediate slopes by its own weight, or is helped along by the sheet of storm-water, by the winds, and by wet-weather streams. On the slopes, if it contains valuable particles in sufficient quantity, it may constitute a hillside placer.

On slopes of low declivity the loose covering is subjected to superficial losses of its lighter and finer particles, and, indeed, it is mainly through such losses that the transfer to the lowlands takes place. Hence the surface layer may be enriched in the valuable minerals if these are relatively heavy or large. The hillside placer may therefore resemble a true residual placer in this particular, and, indeed, as at Iron Mountain, the two may grade into one another without sharp demarcation. The essential distinction, however, is that the material of the hillside placer is not entirely of local derivation, but mainly has come from higher up the slope. The travel, furthermore, results in some rounding of the fragments through mutual abrasion. On steeper slopes the whole mantle of loose material may be in slow motion, with frequent slides of portions of the surface. In that case there can be no tendency toward surface concentration; on the contrary, the tendency is rather toward concentration on the bottom; and the light wash in transit to the valley will always cover the heavy particles which originate on the slope itself.

[3] *Trans.* Am. Inst. Min. Eng., Vo.. XXVIII, p 497.

[4] "The Genesis of Ore Deposits," pp. 152-153.

Boiler Firing with Waste Heat from Coke-Ovens.

In a paper read recently before the Institute of Mining Engineers in London, T. Y. Greener said that it is practicable at a colliery equipped with modern appliances to produce all the steam required without burning more coal than 1% of the output. Such a result is, of course, unusual, and is very seldom realized at those pits which depend for steam entirely on hand-fired boilers. At coking collieries, however, for years past advantage has been taken of the waste heat from coke-ovens for firing boilers, and such collieries are in regular operation at which, over a series of years, the coal consumed for steam raising varies from under 1 to 1.5% of the total production.

It is evident that the selection of suitable boilers is a matter of the greatest importance. While, on the one hand, it is very desirable to use boilers of high efficiency as steam generators, it is equally important, on the other hand, not to fix boilers on the oven flues of such construction as will impede the draft of the ovens and so reduce the output of coke. Of recent years it has been the common practice at English coking collieries to make extensive use of the Lancashire boiler, the five-flued modification of that boiler, and latterly of the Babcock boiler. The writer has boilers of each description working on coke-ovens at several of the collieries under his charge. To compare the results obtained from each, careful measurements have been made of the quantity of water evaporated per hour from each description of boiler, and Table I presents results in such manner that the comparative efficiency of each boiler may be determined.

Below are given condensed descriptions of the boiler plants referred to in the table:

Stanley.—Babcock & Wilcox boiler, 126 tubes each 4 in. diameter and 18 ft. long, and 2,823 sq. ft. of heating surface; 40 Hanson coke-ovens, 16 ft. long, 4 ft. 8 in. wide and 7 ft. high, attached to a chimney 106 ft. high and 6 ft. square. Sectional area of the main flue 14.75 square feet.

Bowden Close.—Babcock & Wilcox boiler, 63 tubes each 4 in. in diameter and 18 ft. long, and 1,426 sq. ft. of heating surface; 20 common and 8 underflue beehive coke-ovens, 11 ft. in diameter, attached to a chimney 90 ft. high and 4 ft. 8 in. square. Sectional area of main flue, 16 square feet.

Ushaw Moor.—Babcock & Wilcox boiler, 126 tubes each 4 in. in diameter and 18 ft. long, and 2,823 sq. ft. of heating surface; 12 Bauer coke ovens, 39 ft. 4⅜ in. long, 1 ft. 7⅝ in. wide and 6 ft. 10⅝ in. high, attached to a chimney 150 ft. high and 8 ft. 10 in. in diameter. Sectional area of main flue, 24.75 square feet.

Esh.—Five-flued boiler, 30 ft. long and 9 ft. in diameter, 1,426 sq. ft. of heating surface, and a Green's economizer attached, with 1,300 sq. ft. of heating sur-

TABLE I. BOILER RESULTS.

Name of Colliery	Stanley	Bowden Close	Ushaw Moor	Esh	Stanley
Class of Boiler	Babcock and Wilcox	Babcock and Wilcox	Babcock and Wilcox	Five-flued	Two Lancashire
Duration of Tests	50 hours or 5 days	40 hours or 4 days	30 hours or 3 days	5 hours	10 hours
Average temperature of flue-gases at front of boiler degs. Fahr.	1,194	1,111	1,477	1,300	1,196
Average temperature of flue-gases at back of boiler. degs. Fahr.	376	393	536	400	378
Average water-gauge at front of boiler ... ... inches	0·40	0·10	0·70	0·60	0·40
Average water-gauge at chimney inches	0·70	0·48	1·20	1·25	0·90
Average temperature of feed-water entering economiser degs. Fahr.	—	—	—	140	—
Average temperature of feed-water entering boiler .. degs. Fahr.	60	101	116	315	60
Average pressure of steam per square inch pounds	53	82	56	90	55
Coals coked per hour ,,	6,213	4,640	7,586	7,280	6,213
Water evaporated per hour ,,	9,432	4,325	11,197	11,270	4,500
Water evaporated per pound of coal coked	1·510	0·930	1·476	1·540	0·720
Water evaporated per hour per pound of coal coked, assuming temperature of the feed-water at 212° Fahr. ... pounds	1·780	1·069	1·653	1·410	0·849
Water evaporated per pound of coal coked, boiler and economiser combined, assuming that temperature of feed-water entering the economiser at 212° Fahr. ... ... pounds	—	—	—	1·710	—
Water evaporated per square foot of heating surface of boiler pounds	3·330	3·030	3·960	—	2·500
Water evaporated per square foot of heating surface of boiler and economiser combined pounds	—	—	—	4 130	—

face; 42 beehive underfire coke-ovens, 11 ft. in diameter, attached to a chimney 150 ft. high and 8 ft. in diameter. Sectional area of main flue, 16.50 square feet.

Stanley.—Two Lancashire boilers, each 30 ft. long and 7 ft. in diameter, and 894 sq. ft. of heating surface in each; 40 Hanson coke ovens, 16 ft. long, 4 ft. 8 in. wide and 7 ft. high, attached to a chimney 130 ft. high and 7 ft. square. Sectional area of main flue, 15 square feet.

The result of the experiments, it would appear, is that if the water evaporated per pound of coal coked be assumed to be the standard of efficiency, the best results are being obtained from the Babcock & Wilcox boilers at the Stanley and Ushaw Moor collieries, and that the five-flued boiler at Esh colliery takes the next place. It is, however, difficult to make a strictly fair comparison of the work of boilers in different coke-yards. The results in each case are influenced by the area and position of the main gas-flue, the height and capacity of the chimney, and the number of hours that the majority of the ovens have been burning at the time that the boiler duty is being obtained.

In preparing the figures, an endeavor was made to have the tests continued over a sufficiently long period in each case so as to determine the duties of the several boilers during coal-drawing hours. The results in the night would undoubtedly be better than those in the day. There would be a more ample supply of steam at coking collieries in the day if the ovens were drawn at night instead of during the coal-drawing hours. Difficulties would, however, arise with the workmen if such a system were generally adopted at beehive coke-ovens, and the probability is that coke loaded in the night-shift would not be so carefully selected as that loaded in the day-shift, and would therefore not be so readily salable.

With regard to the comparative results of the Babcock & Wilcox and two Lancashire boilers at Stanley colliery, it is interesting to note that the two sets of boilers are placed one at each end of a battery of 80 rectangular coke-ovens, and that the main gas-flue is centrally divided and conveys the heat from 40 ovens to the Babcock & Wilcox and two Lancashire boilers respectively; hence, both sets of boilers are working under precisely the same conditions as regards the number and class of ovens from which they are fired; but it is only fair to add that the Lancashire boilers are fixed somewhat lower than they ought to be, hence there is an awkward bend in the main gas-flue, which undoubtedly impairs the efficiency of the boilers. The Babcock & Wilcox boiler was erected for the purpose of generating twice as much steam as the two Lancashire boilers, and it has more than accomplished the object in view.

The efficiency of the Babcock & Wilcox boiler at Bowden Close colliery is not equal to that of similar boilers at Stanley and Ushaw Moor collieries, but the reason is to be found in the conditions under which the boiler is working; it is attached to a battery of beehive coke-ovens originally built without any idea of utilizing the waste heat.

The boiler plant at Esh colliery is doing excellent work, and, as a matter of fact, is evaporating more water than any plant with which it is being compared. This result is due to the Green's economizer working alongside the boiler, and raising the temperature of the feed-water. Apart, however, from the economizer, the efficiency of the boiler is very satisfactory.

There is an important aspect of the subject, and that is whether the results described approximated, even remotely, to those which ought to follow from the amount of heat available for steam raising. The quality of the coal used in the manufacture of coke is practically the same at each of the collieries, and that coal is regularly evaporating under ordinary circumstances in hand-fired Lancashire boilers 8 lb. of water at and from 212° F. per pound of coal burnt. Obviously, all other conditions being equal, the best results in boilers fired by waste heat from coke-ovens should be from those attached to ovens of the beehive type, in which part of the coal itself is consumed in converting the remainder of the charge into coke, and the worst results should naturally be expected from retort coke-ovens, such as the Bauer, at Ushaw Moor Colliery, in which practically none of the coal itself is consumed, and the heat available for steam raising is entirely derived from the gases driven off at a high temperature in the process of converting the coal into coke. It may be assumed that the coal in question contains 77% of carbon capable of being manufactured into coke, and that the remaining 23% is volatile matter. If the writer is correct in his opinion, the results obtained at Bowden Close colliery are unsatisfactory.

At Ushaw Moor colliery, the conditions are different from those in the other yards to which the writer has referred. The boilers are working on modern retort ovens of the latest description, recently erected, from which a yield of coke of 75% of the coal carbonized is being regularly obtained; hence the waste heat is capable of evaporating 2 lb. of water per pound of coal coked, as compared with an actual evaporation of 1.653 lb. The writer is inclined to think, however, that under ordinary circumstances the estimated and the actual results in water evaporated will be nearer in boilers fixed on retort ovens than in those fixed on beehive ovens, notwithstanding that part of the coal is consumed in the latter. Retort ovens are drawn more frequently than beehive ovens, hence fresh rich gas is always being given off, the coke is cooled on the bench, the oven therefore retains its heat and it is quickly loaded and closed up. These advantages more than compensate for the additional heat derived from that portion of the charge consumed in the beehive oven.

At Ushaw Moor colliery, by-products are not being recovered from the gas, and therefore it retains all its hydrocarbons and heat-producing qualities when it reaches the boiler. The writer would not expect, as a rule, to evaporate more than 1 lb. of water per pound of coal coked from gas from which the by-products had been extracted.

Illinois Mining Law.

Secretary David Ross, of the Bureau of Labor Statistics, sends out notice of the following amendments to the Illinois mining law, passed by the legislature at its last session.

Section 23 was amended to read as follows: "The means of signaling to and from the bottom man, the top man, and the engineer, shall consist of a tube, or tubes, or wire encased in wood or iron pipes, through which signals shall be communicated by electricity, compressed air or other pneumatic devices, or ringing of a bell."

The purpose of this amendment, in addition to authorizing the use of a more improved method of signaling, is to provide for the protection and the encasing of the bell wire.

Section 18 refers to the duties of the mine examiners: "In order to correctly determine the quantity of air in circulation in different portions of the mine, it is hereby made his duty to measure, with an instrument for that purpose, the amount of air passing in the last crosscut or break-through of each pair of entries, or in the last room of each division in a longwall mine, and at all other points where he deems it necessary, the same to be noted in the daily book kept for that purpose."

Section 18 prohibits the employment of boys under 16 years of age in the coal mines of this State.

Some changes were made in the mine-inspection districts, but these do not affect coal operation directly.

The auxetophone is an improved form of the gramophone, whereby the speech is so intensified that it may be heard for a distance of from 600 ft. to a mile or more.

Higher geometry recognizes, in theory, not only the space of the old Euclidian geometry (that of daily experience) but also other unique varieties of space, as those of Lobatschefski and Riemann.

The iron-ore beds of northeastern Texas are described as thin (2 or 3 ft.), but diffuse sheets of hematite, of wide distribution in occurrences which are individually small and scattered.

Simultaneous Joints.

BY GEORGE F. BECKER.

Joints are almost universally distributed over rock exposures, and they are so highly significant that the interest attaching to them can never be exhausted. In the present paper I propose to discuss systems of joints of simultaneous or almost simultaneous origin, not with the idea of developing any new principles, but in order to call the attention of geologists and mining men to some details which have been insufficiently considered, although they are of importance in reading the record of mining districts and tectonic belts.

Most fine-grained solids which are capable of rupture under given conditions behave similarly. Exceptionally plastic or ductile bodies, like aluminum and pure lead, can scarcely be broken by crushing. Some substances again show different resistances in different directions; for example, single crystals, like those of quartz, and masses with a laminar structure, such as slate. But massive rocks in large masses, as well as many limestones and sandstones, cast iron and some forms of steel, are to all intents and purposes isomorphous in that they display practically equal resistances in all directions. Such materials when subjected to forces obey the same laws as softer solids, such as plaster of paris, wax and ceresin (the trade name for a mixture of crystalline paraffines derived from ozokerite). It would indeed be extremely perplexing if large blocks of materials, composed of small crystalline grains irregularly oriented, did not show common properties.[1] Even clay, so little moistened as to be 'stiff,' acts as if it were a true solid.

These isomorphous, or pseudo-isomorphous, substances rupture in two ways, both of which may often be illustrated in the same experiment. One species of fracture takes place by tension, and is usually characterized by sharp curvatures and uneven surfaces; the mass is *torn* asunder. The other method of fracture is by shearing motions, due to pressure; the mass is *cut* to pieces by surfaces which are often, and in fact characteristically, flat and smooth.

Persistent joints and systems of joints are due to pressure, while the partings between columnar basalts and the very similar cranks in drying mud arise from tension. In mining districts, tension cracks often appear as a subordinate phenomenon where faulting has forced apart slaty walls, leaving splinters attached to both sides of a fissure which itself arose from pressure; and I have even seen similar occurrences along the crevasses of a glacier. So, too, when a cylinder of relatively mild steel is crushed, the bulging edge of the mass may show meridional tension-cracks due to the increase of the equatorial periphery, even when the interior displays diagonal fracture. The behavior of cylinders, however, has some peculiarities which will be mentioned presently.

Rocks are often ruptured without much preliminary deformation, and it is easiest to begin with the hypothesis that the deformation is negligibly small. The effect of larger deformation can be traced after the principal characteristics of rupture have been examined. It is also convenient to consider first of all a cubical, or at least a rectangular, mass.

Suppose, then, that a cube of rock (shown in Fig. 1) is subjected to a perpendicular and evenly distributed force acting on its upper and under surfaces, while the face *A* and that opposite to it are supported in such a way as to obviate rupture. Then the effect of force will be to produce ruptures along planes perpendicular to *A* and inclined in opposite directions at an angle of 45° to the line of force. Two systems of joints will result, forming angles of 90° to one another on *A* or sections parallel to this face. On the face of the cube marked *B*, and that opposite to *B*, the traces of these joint-planes will be horizontal straight lines, while on the surfaces on which the forces act—that is to say, on the top and the bottom of the cube—the traces of the joints will be parallel straight lines perpendicular to *A*. By these means the cube will be divided into a number of square prisms, so placed that the diagonals of the squares are either horizontal or vertical.

It has come to be pretty generally recognized that two systems of joints, such as those described, may be produced by a single force acting at an angle of about 45° to each system. If the deformation antecedent to rupture were of sensible amount, the joints would make angles of somewhat more than 45° with the line of force. It is not so generally understood that four, or even more than four, systems of joints may be due to a single force. This case is less common than that of a smaller number of partings, and is usually confined to limited areas, but it is not infrequent, particularly in the disturbed regions which ores so much affect.

Imagine a second cube, shown in Fig. 2, similar in all respects to the first, excepting that the faces *B* and its opposite are supported, instead of faces *A* and that opposite to it; then, of course, the result will be the formation of prisms whose square cross-sections will be visible on *B*, instead of on *A*. If, on the other hand, the cube is not supported on any side, or if the resistance perpendicularly to the line of force is uniform, then these two systems of rupture will take place simultaneously, so that on both *A* and *B* there will be systems of cracks at 45° to the line of forces intersecting one another at 90°, while each of these faces will also show horizontal cracks. By these means, the cube will be divided into octahedral and tetrahedral blocks, as indicated in Fig. 3 and 3*a*. Such rupturing can be, and has been, experimentally verified, for instance, by Daubrée; but I know of no experiments so nearly perfect as instances which may be observed occasionally in rock exposures.

In experiments on cylinders, the lines of rupture are often found to be conically disposed, and this mode of rupture requires explanation, especially as corresponding phenomena are so rare in nature that I have never met with them. When a cylinder is linearly compressed (say, vertically) between masses of much more rigid material, the cylindrical form is not preserved, the mantle of the cylinder expanding to the shape of a barrel. The reason for this is that intense friction is produced by the effort of the end surfaces to expand in contact with the rigid planes exerting the vertical pressure. I have experimented somewhat elaborately on the character of this strain, and have determined the position of the strain ellipsoid at 64 points on a vertical cross-section. The greatest axis of the ellipsoid lies in the plane passing vertically through the center of the cylinder, but it is not horizontal; it is inclined to the horizontal at an angle which varies with the distance from the central vertical axis of the barrel-shaped mass. The least axes of the ellipsoid also lie in the vertical central cross-section of the mass, and the surfaces[2] of 'maximum tangential strain' are conoidal with their apices in the axis of figure. It is along these latter surfaces that rupture, due to pressure, must occur if at all, as I showed long ago. At any one point of such a cylinder the strain is homogeneous and exactly comparable to that in a uniformly strained cube. The peculiarity of experimental results on cylinders lies in the radial symmetry of the stress system.

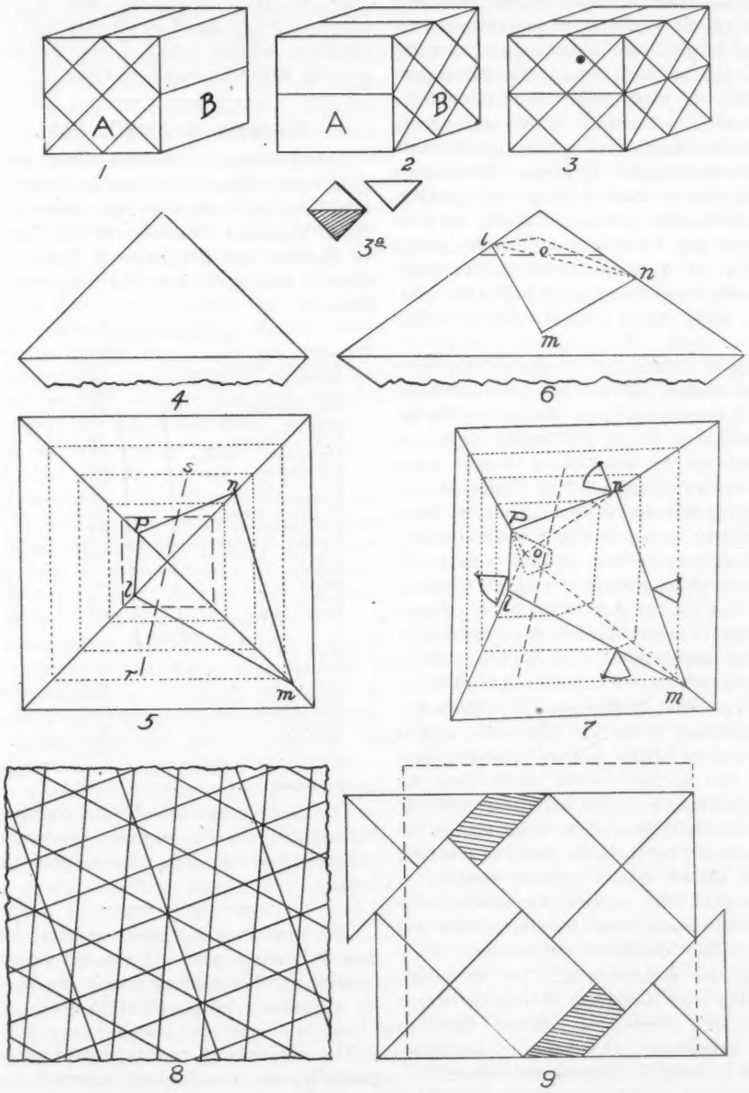
If it were possible to crush cylinders between frictionless surfaces, so that the deformed blocks would retain a uniform diameter, the strain ellipsoids would have two equal horizontal axes, and, if the mass were ideally homogeneous, it is difficult to see what would determine the position of the ruptures. But this is not an important question. In real matter the resistance could not be exactly the same in all directions, and two systems of joints would form, as in the cube. In a cubical mass, or in one of square cross-section, the cracks will be perpendicular to the sides of the cube, as explained above, because this is the position of least resistance, or because a unit area of rupture in this orientation goes farthest toward relieving the strain in the yielding mass.

[1] With glasses, a class of bodies which needs more study than it has received, I shall not deal in this paper.

[2] U. S. Geol. Surv., *Bull.* 241, 1904. The surfaces of rupture are such as would be obtained by rotating Fig. 4 about its smallest diameter, but if the deformation were small these surfaces would be indistinguishable from right cones.

In the lithosphere, when crushing or jointing takes place, the masses exerting the pressure are almost invariably little more resistant than the rock which is ruptured. It is very seldom, therefore, that these features of experiments are observable in nature, which depend on great differences in strength between the material tested and the apparatus used in testing.

In cases of uniform lateral resistance, then, at least four systems of joints may form simultaneously as the result of the action of a single force, separating the rock into octahedrons and tetrahedrons. Very minute differences in resistance would of course modify the development of the octahedral faces, but the four sets of planes at least would be, and often are, perfectly distinct.



TYPES OF JOINTS.

In experiments the four surfaces are so oriented as to be readily distinguished, but in nature such orientation is relatively rare. Tectonic forces are not usually exactly horizontal or exactly vertical, and the exposures due to erosion or other causes are generally inclined surfaces. Now, granting the simplicity and symmetry of the fissuring, it is not at once evident how the joints would be distributed on a plane taken at random through the jointed mass. It is really an easy matter to project the fissure systems on to a random plane, and requires only the application of rudimentary descriptive geometry; but the step has not heretofore been taken, while it is interesting to compare the results of the process with natural examples. The plots also indicate how observations on a random plane may most simply be dealt with when it is desirable to reduce field data to a symmetrical orientation and to find the line of force.

On account of its bilateral symmetry the octahedron gives a convenient starting point for constructing a random section. This octahedron will not be a regular one, inasmuch as the angle between two planes taken over the coign will be a right angle, and the triangles of the octahedron will therefore not be equilateral. Fig. 4 shows such an octahedron so drawn as to expose to view only two of the triangular faces. Fig. 5 shows the same octahedron in plan and Fig. 6 in elevation, four faces being visible. In order to display the fissure systems of the jointed mass taken on a random plane, any three points on the edges of the octahedron may be selected in Fig. 6, such as *l*, *m*, *n*. These points, of course, fix the plane. By evident and familiar methods the random plane can now be brought into the plane of the paper as shown in Fig. 7,[a] where also the direction and amount of dip of the four surfaces is shown as determined by an easy construction. Finally, from the data of Fig. 7 and the hypothesis that the fissures are evenly distributed in space, it is possible to display the traces of the joints on the random plane as shown in Fig. 8.

Every observer who has paid attention to systematic jointing will recognize the similarity between Fig. 8 and certain field occurrences; it is noticeable, too, that the effect produced by Fig. 8 is much more complex than the indications of Fig. 1 and 2 might lead one to expect. Such a joint-system as is displayed in Fig. 8 does not ordinarily extend over any large region of country, and the reason is that in nature, as a rule, the unequal support offered by surrounding rock-masses is sufficient to suppress one or more of the joint-systems. As pointed out above, it is only when the resistance perpendicular to the line of force is the same in every direction that all four systems of joints will appear. On the other hand, even more complex systems are sometimes found locally developed, for reasons which will be set forth a little later. The process of construction outlined can be reversed, so that if the spacing and dip of the fissures on the random plane were given, the quadrangle of Fig. 7 could be drawn and the position of the octahedron or the line of force determined. There are natural cases in which this reduction would be instructive. In the construction of Fig. 8, it has been assumed that the permanent strain at rupture was insignificant, and, on this hypothesis, the faces of the octahedron are isosceles triangles with one angle of 70° 32′ and two equal smaller angles. If permanent deformation of notable amount preceded rupture, the single angle would be greater than 70° 32′.

In the foregoing, it has been supposed that the joints are mere cracks and that no measurable amount of motion occurs on any of them. This is often approximately

[a] Transfer the intersections of the random plane from Fig. 6 to Fig. 5; draw also in 5 a square (parallel to the plane of 5) which will contain the point at which the random plane intersects the axis of the octahedron. Then the line *r s* is common to 5 and 7, and rotation of 5 about the line *r s* yields 7. In constructing Fig. 7 it is necessary to have a vertical section through Fig. 5 perpendicular to *r s*. In finding the spacing for Fig. 8 it is convenient to have two other vertical sections of 5, one along the line *p m* and the other along *l n*. It is unnecessary to state that computation might be substituted for construction if a high degree of accuracy were called for.

true in nature. The throw of the faults produced on the joints is sometimes so small as to be microscopic, and I have measured great numbers of such dislocations which were expressable only in hundredths of an inch. Nevertheless, it remains true that a joint does not form except in obedience to a tendency to faulting. When a block of any material is squeezed between a plunger and an anvil, it does not crack until it can yield no further without cracking. In other words, rupture takes place in order to permit a closer approach between plunger and anvil than is consistent with the continuity of the block subjected to experiment. These cracks undergo a certain throw in the very act of forming. In order to perceive the nature of the dislocation, it is best to assume that it reaches a considerable amount. I will suppose, for example, that the shortening of a ruptured block is 10 per cent. Then the dislocation must be of the type represented in Fig. 9, though a certain variety in the disposition of the residual fragments is evidently possible. Now, Fig. 9 shows several large faults, and the shortening evidently could not have been achieved without these or equivalent dislocations.

It is often assumed that when one fissure faults another the latter is the older, but this inference is not justifiable and they must often be of exactly the same age. Very frequently interlacing quartz veins may be studied in which the quartz is continuous from one system of ruptures to the other, and in which there is every indication that the ore was deposited at a single epoch. Such instances show no slickensides within the veins, but even when there are slickensides these may possibly be due to fresh movements on the old surfaces after ore deposition is finished. Of course I do not mean to deny that cases occur in which some veins are younger than others with which they are associated. I merely mean to warn colleagues against hasty inferences in regard to the relative age of veins.

If such a system of dislocations as is shown in Fig. 9 were to be produced under any considerable external pressure, it is manifest that the several residual fragments might be pressed against one another with great force. In such a case the mere grinding action accompanying the dislocation would tend to produce further ruptures in the residual fragments. It is not easy to work out a satisfactory theory of the distribution of such secondary fractures. It is fairly evident, however, that in an extensive complex, of which Fig. 9 may represent a small portion, there is likely to be a repetition of identical conditions, so that many separate blocks will be similarly situated with reference to their neighbors. If secondary rupture takes place, such blocks will be similarly affected and their fissures will be parallel, but probably not continuous throughout the mass. The more numerous the groups of similarly oriented blocks after the original jointing, the more numerous will be the systems of blind secondary joints. These latter may indeed be regarded as subsequent to the original joints, yet the difference in age may be only a second or two, and the brevity of the interval should be taken into account in reading the history of the district.

To me it appears questionable whether, in a region once jointed by a system of forces, the application of a new system of forces could produce a fresh set of joints systematically arranged. The resistance of a jointed rock-mass is so extremely unequal in different directions, and so small in many of them, that fresh movements on the old joints or the reduction of the formation to a chaotic rubble seems more probable than anything comparable with renewed systematic jointing. Thus forces acting on a brick wall usually produce cracks which follow the joints between bricks, and if bricks were not designedly laid so as to 'break joints,' and carefully cemented beside, cracked bricks in damaged walls would be still rarer than they are.

Fig. 9 shows that a cube fractured by pressure must occupy a larger volume than it did before fracture. Following the indications of Fig. 9 the lateral expansion would amount to over two-tenths when the vertical diminution of height is one-tenth, so that the crushed cube under these conditions would occupy a volume nearly a third greater than before rupture. It follows, then, that in a rock-mass which has been jointed there must be an increase of volume which cannot be without geological importance. There are various ways in which this volume might make itself manifest. If the material surrounding the crushed mass does not yield, and if one surface of the crushed mass coincides with the surface of the earth, then the area affected by joints must rise regularly or irregularly above this level. If, on the other hand, the space subjected to crushing is so placed that a vertical swelling is impossible, the masses surrounding the crushed volume must be driven back and thus either deformed or crushed. Now nearly all rocks are affected by joints, and the total increment of volume over a large area affected by joints is likely to find expression in technically important faults or even in tectonic movements.

Of course, rock-masses are usually supported on all sides, or on all sides but one, by masses presenting great resistance either to deformation or to rupture. This would not obviate the tendency to the formation of joints on systems like those represented in Fig. 1, 2 and 3, but it might prevent, or partially prevent, the realization of these ruptures. In such a case, what would be the internal changes affecting the rock-masses? Evidently there would be relative movements along the lines on which joints tended to form, but since no opportunity or an insufficient opportunity was afforded for an increase of volume, few joints, or none at all, would result. In the extreme case, the result would be deformation without rupture. In so far, however, as the actual relative motion of the particles exceeds the limit of elastic recovery, it is natural to suppose that cohesion along these surfaces would be diminished and that the mass would manifest this alteration of structure by splitting more readily in these directions than in others bearing no relation to them. It is to such a weakening along the surface of relative motion that I have ascribed the origin of schistosity and slaty cleavage, subjects which I have discussed at quite sufficient length elsewhere.

Fineness of Asiatic Gold.

Determinations of the fineness of native gold from various localities in Japan and other Asiatic countries have been made by J. Yokobori (*Memoirs* of the College of Science and Engineering, Kyoto Imperial University), with the following results:

PLACER GOLD.

Locality.	Gold.	Silver.
Aikawa, Sado	585.1	.....
Futsmi, "	597.5	.....
Nubo, "	620.0	.....
Nishimikawa, Sado	666.6	.....
Peichan, Hokkaido	792.3	192.9
Teshio, Japan	838.0	158.3
Usotannai, Japan	807.7	142.3
Yuhbari, "	895.0	97.2
Sorachi, "	843.0	.....
Toimaki "	868.9	82.5
Shogawa, Hida	838.3	157.1
Yoshinogawa, Iyo	903.9	.....
Kiufun, Formosa	733.9	237.9
Irkutsk, Russia	905.2	94.8
Tomsk, "	911.1	88.9
Barnaul, "	846.0	154.0
Korea	802.8	.....
Manchuria	838.5	127.4

LODE GOLD.

JAPAN.		
Sado	565.8	.....
Idsu	512.5	.....
Kago	607.5	.....
Yamagano	635.7	.....
Hoh	816.9	.....
Ohkudzu	926.6	.....
Ohtani	725.0	269.5
Ushio	720.8	227.8
Serigano	393.8	.....

The gold from the Siberian placers is remarkable for its fineness, reaching a point seldom found in alluvial gold anywhere.

The new incandescent-lamp glass bulb has a bead in place of the old pointed outside tip, the tip being now in the inside. It is patented by G. P. McDonnell.

The hardness of certain waters can be partially, or even largely, removed (according to N. Knight in *Chemical News*) by simple heating under pressure. This applies especially to the carbonates of lime and magnesia, but not to the calcium sulphate present.

The dust in blast-furnace gases may be determined by sucking down the gas through a dried and weighed filter paper held in a clamp or frame. The paper holds the dust, which is removed, dried and weighed. The suggestion is from the *Teknisk Tidsskrift*, of Stockholm, Sweden.

The Alabama Coal Miners' Strike—An Operator's View.

The following comments on the strike of the coal miners in Alabama, which has now continued for nearly a year, are from the report of the Tennessee Coal, Iron & Railroad Company, recently issued:

The strike inaugurated by the United Mine Workers of America in the coal mines of this company was the most important event of the year in its far-reaching consequences to the company. Mining ceased July 1, when the existing scale expired, but a strike was not declared until August, negotiations between the operators and miners having failed. The nominal question involved was one of wages and rules, but the differences in these regards were slight, the real point at issue being vastly more important, indeed vital to the future prosperity and even the independent existence of this and similar manufacturing companies in the district. For years the authority exercised by the officers of this company over its coal mines has been growing less and less. The efficiency of the men, whether working by the day or on contract, was steadily declining and discipline had decreased with efficiency. The control the officers were able to exercise over the business of the company was far below what its owners and directors should expect or what is necessary for proper and economical operations. The conditions forced upon the management by the union had become intolerable. The authority of your representatives over the property in their charge, as to the manner in which the work should be done, as to what should constitute a fair day's work, and as to who should be employed, had to be restored and maintained, or all hope of permanent, successful competition with the products of other districts would have to be abandoned. Another important consideration arose from our desire to introduce electric coal-cutting machines, similar to those in use in Pennsylvania, Ohio and other northern States. We asked the union to allow us the same differential for machine-mined over pick-mined coal that is allowed by the union in Pennsylvania at corresponding mines. This was refused, the union officers offering us a differential of 50% less than is allowed by their organization elsewhere, it being clearly their intention to prevent the use by this company of coal-cutting machines. Under the present non-union operations the machines have been introduced with most satisfactory results.

As illustrating the decreased efficiency resulting from union domination, the Gamble mine of this company in Walker county, Alabama, may be cited. Since it was made a non-union mine, the product per man per day has increased 1½ tons, and the earnings per man per day have increased 52.5c. At the same time there has been accomplished a reduced cost per ton of product to the company. There has been no change either in the mine, the manner of working, or the equipment. The increased output and earnings are due solely to greater capability and effort on the part of the men. At all of our mines a small product per man was favored by the union, and at some of them, a man, no matter how skillful and industrious, was permitted to mine no more than the least efficient.

The strike having been declared, the management immediately announced its purpose to re-open all its mines on a strictly non-union basis. Operations were gradually resumed at all of the principal mines, except where the introduction of improvements caused a further delay. The strike has unfortunately been marked by some violence. The most lamentable occurrence was the assassination of Superintendent W. S. Lang, who came to this company from Virginia to take charge of its Blocton mines, and who was soon recognized as one of the best and most energetic managers in the district. He thus inevitably antagonized the local leaders and officers of the union. Mr. Lang was shot at night from ambush while attending to his duties. That these remarks may not create a wrong impression, it must be recorded that a large majority of the miners are law-abiding men and regret Superintendent Lang's untimely death as deeply as the officers.

The Sumter mine, in the Blue creek division, which had been one of the first to resume and where normal conditions had apparently been restored, was set on fire early in the present year. The fire has since been extinguished, but it has not yet been possible to resume work, and the direct and indirect loss to the company from fire and subsequent idleness will be large. In order to protect its employees, the management has caused to be erected more than 200 new miners' houses on the company's own locations, where the men can live and work without being subjected to intimidation from the strikers. The company now has in its employ a sufficient force of miners. Many of the old employees have returned to work, and men have been attracted from other States by reason of the very satisfactory conditions of labor existing in this district. When the new men have acquired the necessary familiarity with strange conditions, and when the completion of the mechanical improvements now being installed permits the full resumption of the mines still idle, or in partial operation, it is confidently expected that normal conditions of product and cost will be restored.

From the first it was very fully recognized what a strike would mean in the disorganization of operations and in loss of business and profits, but in all their efforts to free the company from the humiliating and arbitrary domination of a labor organization, the officers have received the constant and unanimous support of the board of directors, who were convinced that, if the property was to be protected, the cost of a long strike was a necessary investment, and that the future gain to the company to be realized from the ability of the management to fully control its own operations, untrammeled by union restrictions, will be incalculable.

Mont Pelé Again.

According to late press despatches from Martinique, Mont Pelé has shown a renewal of volcanic activity, which, while stronger than that of the month of April of the present year, does not seem to be of an alarming nature. Some dense clouds of smoke have been discharged from the volcano, and have slowly fallen over the White River valley, afterward disappearing on arrival at the sea coast. Sharp, luminous flashes have been perceived at the dome of the mountain, and a fairly strong burst of flame was seen on the afternoon of June 3. At that time a thick cloud of smoke descended almost to the sea, and the cinders thrown up extended over the village of Le Précheur, which is on the extreme line forming the limit of the territory devasted during the terrible outbreak of May, 1902, and then swept seaward and disappeared. After this the volcano again became calm, and so remained until the night of June 10-11, during which the dome was illuminated by numerous luminous points. The collapse of part of the dome then occurred, at six o'clock in the morning. It was accompanied by an outflow of mud into the White River valley. On the same morning a dense cloud of smoke slowly arose from the crater to the estimated height of about 3,000 ft., and extended toward Le Précheur, where the smoke was dissipated. Since then the volcano has remained calm.

In the Nernst lamp an accessory heater is required to start the glower, which does not conduct electricity well till heated. This heater is made by winding fine platinum wire on a porcelain tube.

The spark discharge, as from a Leyden jar, is not a solitary explosive release of tension, but a large number of oscillatory discharges, growing successively less. To this lessening has been applied the term 'the rate of decay,' the ratio of the intensity of successively diminishing oscillations being a constant. (J. A. Fleming.)

The celebrated Michelson-Morley experiment was an attempt, executed in various ways, to ascertain whether the luminiferous ether exhibits any drag-inertia, or influence on ponderable matter. The results were practically negative, but this may mean only that the apparatus was either not sufficiently sensitive, not properly constructed, or was not adjusted for the work in hand.

Kwai Yuen Mines.

SPECIAL CORRESPONDENCE.

The Kwai Yuen mines are those embraced by the Kwai district (Kwai Yuen). The district being in China is, of course, an old one. The date of discovery is a mere conjecture. This much we know, that they have been worked for at least 40 years, dating back to the time when the original discoverers were driven from the country by one Wong Sam. The story, as told by the old miners, runs as follows: Many years ago a native was on his way to the village store carrying a small load over his shoulders. As he passed down the valley he sought, as is the Chinese custom, a stone with which to balance his load. Having picked up one of suitable size he adjusted his burden, doubling its weight, and went on to the store. A stranger, a Hunanese, was at the store and as the farmer put down his burden, the stranger's eye was caught by the unusual color and luster of the stone. He opened a conversation with the farmer, who at first was reluctant to tell where he got it, but was finally persuaded to tell that and also to lead the Hunanese to the place where it was picked up. The stranger soon located the vein and returned home for his provincials who were to assist in its development. The natives, or Hakkas, soon became jealous and suspicious of the Hunanese, of their dark holes and fire furnaces on the mountain side, and tried to drive them away. A compromise was made and the Hakkas were persuaded to learn the business. It is said that the Hunanese were the original miners in the Twokwangs, and from them the natives have received whatever knowledge they possess in all mining and smelting matters.

This first discovery in the district was on the Tin Peng mountain, and here the Hunanese burrowed one hole after another down to water level, until they were driven back, about 40 years ago, into Hunan by a Wong Sam, who had gathered about him a small following, and established himself as a tributary chieftain. Since that time the mines have been wholly worked by the Hakkas. Within the last few years a number of Cantonese, who have made money abroad in the mining business, have returned home to continue the development of the old Kwai Yuen mines after a modern fashion.

1. GENERAL VIEW KWAI YUEN MINES.

Three companies are now at work in this district and, so far as I have been able to learn, their claims are unlimited and some 20 miles apart. The most recent has undertaken the development of the old Tin Peng mines. They are at Tin Peng and Sam Cha. It was while the Hunanese were at Tin Peng that they discovered the ledge at Sam Cha, where the ore is similar. At Peng Tung they are mining lead.

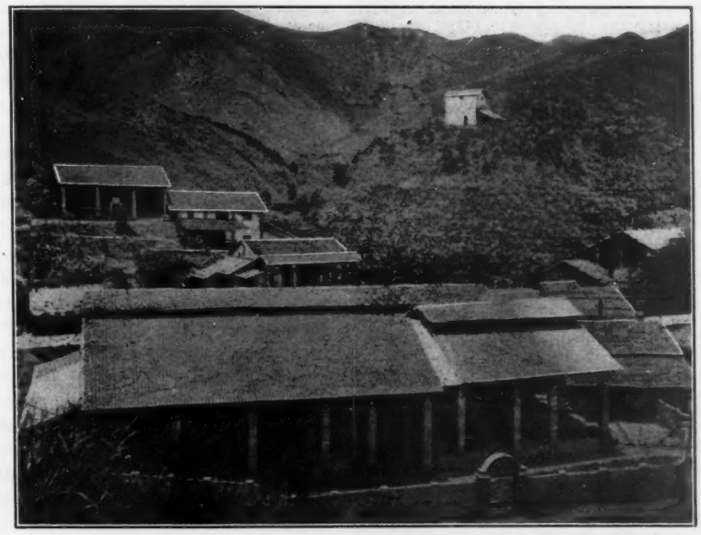
Sam Cha is about 400 miles up the West river from Canton. The district city of Kwai may be reached by steamer and launches from Hong Kong in about 68 hours. The route is by way of Canton or direct to Wuchow, Konghau and Kwaipeng. From Kwai Yuen to Sam Cha it is about 18 miles over the mountains. To reach the place you may have your choice of walking, riding Chinese ponies or taking a dirty sedan chair. Transportation and accommodations such as we foreigners would like are not to be had at Kwai Yuen. You will be fortunate if you carry letters to the city magistrate from the viceroy at Canton. Under these conditions you will be most hospitably entertained, provided with good ponies, and a military escort which will see you safely to and from the mines.

The development of the Sam Cha mine was first undertaken by the Wa King Mining Company of Hong Kong and San Francisco about seven years ago. Its history, I am sorry to say, is like that of many another mining company in China —mismanagement, unqualified engineers, and failure. They filed bankruptcy papers last year at Hong Kong, and in the winter the company's business was wound up. A new stock company, called the Po Hing Mining Company, was formed. A number of the stockholders of the old company hold shares in the new, but the management has been entirely changed. Mr. Cheung Pat is president, general manager and treasurer. He is one of the commissioners in connection with the Canton & Hankow railroad, a man of ability and wealth. And his name, associated as it is with the company, should insure success where success is possible. Mr. Chon Ah Fuk, vice-president and assistant manager, is of Watkins & Co., druggists, Hong Kong. Man Sun Wo are the Hong Kong agents. At the mine Young Yuen is resident manager; Ma Chun Kee, metallurgist; and Tsoi Kam, chief machinist. They are now looking for a competent mining engineer. There is a superabundance of machinery at Sam Cha for the development of the mine. The number of pieces

2. SMELTER AND SHOPS.

intended originally for immediate use have lain so long without being installed that I fear they will be practically useless when needed. I was really saddened by the waste lying everywhere about.

The accompanying illustrations are reproduced from photographs taken at the mines. No. 1 is a general view of the Po Hing Mining Company's plant at Sam Cha Shan, Kwai Yuen, Kwang Si, China. The dump and track, the brook, and the main entrance are in the foreground. The quarters of the resident manager and the metallurgist are hidden behind the bamboos on the left; the roofs only can be seen. In No. 2, the large building in the center is the new smelter, containing a blast-furnace, two small reverberatory furnaces for softening base bullion and liquating zinc crusts, desilverizing kettles, and a set of six Faber du Faur retorting furnaces, built about a vertical flue. The quarters of the skilled laborers, the blacksmith shop, the machine shop, and the stock-room are just behind. Up on the hillside, to the right, is one of the guard-houses, and on the opposite hillside is the powder magazine. The vein runs across the valley behind and almost parallel to the smelter. No. 3 is another view of smelter and shops. The buildings just to the right of the smelter contain the new power plant. And on the extreme right may be seen the southern end of the old chlorination works.



3. ANOTHER VIEW OF SMELTER.

In extremity all help is valuable; and perhaps one of the best illustrations of the application of this to improvements in civilization is the suggested use of the blind fish of the Mammoth cave of Kentucky in the anti-mosquito warfare. The difficulty may be found in the bringing together of the fish and the eggs of the winged scourge. But the list of mosquito-cides is growing; it includes drainage, the use of poisonous chemicals, and now the blind fish.

Ammonia Cyanidation of Copper.*

In the discussion of the original paper by Jarman and Brereton, H. Livingstone Sulman[1] said: I venture to offer a suggestion as to the nature of the reactions which underlie the ammonia-copper process. The reactions involved depend, initially, upon the instability of cupric cyanide. When a solution of potassium cyanide is added to a soluble cupric salt, cupric cyanide is produced only momentarily, if at all; cyanogen is liberated, and a precipitate of varying composition is formed consisting of hydrated cupric-cuprous-cyanide. This, brownish-yellow at first, becomes lighter in color on standing, as it is slowly resolved into a compound containing increasing quantities of cuprous salt, with a corresponding evolution of cyanogen, until it finally becomes, in the main, cuprous cyanide. These various compounds are soluble in ammonia, and in ammonium cyanide (as well as in other alkaline cyanides), producing *two* different classes of ammonium-cuproso-cupric cyanides, of varying stability, although both are decidedly more stable than any of the cuproso-cupric cyanides alone.

The *first* of these two classes is of the true double-cyanide type, namely:—(R Cy)$_x$ (Cu Cy$_2$)$_y$ (Cu$_2$ Cy$_2$)$_z$ — where R is an alkaline metal or radicle: these compounds are colorless and highly soluble, and usually contain more than one equivalent of alkaline cyanide. In the absence of other metallic salts the members of this class of double cyanides are stable, and do not lose cyanogen spontaneously; they yield, however, only weak gold solvents. But inasmuch as they are at once decomposed by any excess of a copper salt (losing their associated alkaline cyanide equivalent, and being again converted into a mixture of cuprous and cupric cyanides), they are evidently not produced in the reactions we are here considering, where an excess of copper over cyanide may be always assumed to be present. The reactions which occur when ammoniacal cupric salts are decolorized by potassium cyanide, as in the volumetric estimation of copper, involve the production of the colorless, or true, double cyanides.

The *second* type is that yielded by the solution of cuprous-cupric-cyanide mixtures in ammonia. They are not true double-cyanides, but rather 'cuprammonium' salts in which ammonia (instead of ammonium cyanide) is probably directly combined with copper cyanide; ammonia is, at least partially, liberated from the compounds on heating, and all the cyanogen is, at least initially, saturated by copper. This type gives compounds which are somewhat less soluble, yielding deep-blue solutions. They are not, however, decomposed by additional copper salt, provided a sufficient excess of ammonia be present, as their cyanogen is already fully combined with copper. It is this class of cyanide which appears to me to be responsible for gold-solvent effects, as its solutions not only slowly break down spontaneously, but do so more readily in the presence of any metal (such as gold) capable of exerting a chemical 'pull' on that portion of cyanogen so loosely held by the cupric-cyanide portion of the molecule.

Ammonium-cuproso-cupric cyanide (or 'cuprammonium cyanide') solutions may thus be regarded as a temporary storage of nascent cyanogen ready to be drawn upon by any cyanidable metal. As this abstraction of cyanogen proceeds, the blue color of the liquid becomes less intense, the copper salt produced becomes less soluble, and small bright-green needle-like crystals of ammonium-di-cuproso-cupric cyanide are deposited. These have the composition $(NH_3)_4$ $(Cu_2Cy_2)_3$ $(CuCy_2)$, are insoluble in cold water, slightly soluble in dilute ammonia, though, of course, readily dissolved by an excess of alkaline cyanide to the colorless double-cyanides. Ammonium-di-cuproso-cupric cyanide is stable at ordinary temperature, and probably represents the limit of the cyanogen store which can be drawn upon from a solution which originally contained alkaline cyanide and ammonia sufficient to yield the theoretical equivalent of ammonium cupric cyanide.

If, therefore, potassium cyanide solution, together with a working excess of ammonia, be added to an ore which contains an amount of cupric salt sufficient to saturate the former (such as that referred to by Messrs. Jarman and Brereton) it will, with liberation of some cyanogen, be converted into compounds of the cuprammonium-cyanide type, which are capable of yielding further supplies of nascent cy-

*The abstract of the original paper by Jarman and Brereton appeared in this JOURNAL, April 27, 1905, p. 802.

[1] Abstracted from the *Proceedings* of the Institution of Mining and Metallurgy, March 16, 1905.

anogen available for gold dissolution, until the final stage, marked by the insoluble double salt just mentioned, is reached; the appearance of these green crystals in increasing quantity marks the growing exhaustion of the solvent. The reaction between alkaline cyanide, copper in excess, and ammonia, therefore, produces a solvent which appears to differ fundamentally in action from that of ordinary cyanide, in being independent of oxygenation; it also follows that any excess of cupric salt, above that necessary to produce cuprammonium cyanide, may be present without destroying this solvent, as such excess cannot further combine with the already copper-saturated cyanide equivalent. If the excess of cupric salt present be readily soluble, an excess of ammonia will be necessary to prevent abstraction of NH_3 from the cuprammonium cyanide; but if it exists as carbonate, the presence of a more limited amount of cuprammonium carbonate appears to act as a protective agent to the cuprammonium cyanide.

Several equivalents of ammonia are also required for the cuprammonium cyanide produced. Hence the necessity for a working excess of ammonia considerably above the equivalent of cyanide employed. An excess of ammonia undoubtedly tends to keep cuprammonium cyanides more or less soluble, especially those which have not reached the full cuprous limit; therefore unless the solvent is completely exhausted, ammonio-copper-cyanides are still left in solution. The stage of crystalline deposition marks a point where loss of ammonia and cyanogen in the sand may rapidly overbalance the economical recovery of gold, especially when the amount of crystal separated bears no ratio to the gold dissolved.

It seems evident that the broad explanation of the ammonio-copper-cyanide process is dependent, *not* on the solvent action upon gold of potassium cyanide, nor of ammonium cyanide, whether combined with copper cyanide or not, *plus* oxygen, but upon the formation of ammonium-cuproso-cupric cyanides of the cuprammonium type, which, gradually yielding up some portion of their cyanogen content, act as powerful solvents for gold until their limit of stability and solubility is reached, without the necessary intervention of oxygen. When they reach this limit they cease to act as solvents, and tend to separate in the crystalline form noticed by the authors. It is probable that the gold is converted by nascent cyanogen into simple aurous cyanide, which is readily soluble in any slight excess of ammonia and ammoniacal salts.

Messrs. Jarman and Brereton's conclusion is "that an ammoniacal cupriferous cyanide is produced, of low solubility, having the property in common with copper potassium cyanide that the copper in it is replaceable by gold—(i.e., in part)."

I think, however, it will be clear that while an ammonium cupriferous cyanide is responsible for the solvent action, it is not of the copper-potassium-cyanide type referred to by the authors, but a cuprammonium cyanide containing no cyanogen combined with alkali-metal. Further, it appears that the gold is not dissolved by replacing copper, but that this takes place by virtue of nascent cyanogen derived from the cupric cyanide of the cuprammonium compound. That copper is deposited while the dissolution of the gold proceeds is undoubted; but this is due, not to replacement of copper by gold, but to the formation of increasingly insoluble cuprammonium cyanides from the breakdown of the cupric cyanide radicle with loss of cyanogen.

In discussing the original paper of Messrs. Jarman and Brereton, and the remarks of Mr. Sulman, T. Kirke Rose said: An ounce of fact is worth a ton of theory. Carefully observed experiments, such as those of Messrs. Jarman and Brereton, remain a solid rock on which superstructures of theory may be built. At the same time it is a pity that they have not offered satisfactory explanation of all their experiments. They have given themselves unnecessary trouble by not making use of the theory of electrolytic dissociation with which they are perfectly familiar. A dilute solution of potassium cyanide is dissociated in two ways; it suffers both hydrolytic and electrolytic dissociation. The hydrolytic dissociation ($KCN + H_2O = HCN + KOH$) is slight. In solution containing 0.65% of KCN only 1.12% of the KCN is split up at 25° C. That has hardly any effect on the solvent action of cyanide. In more dilute solutions, still less cyanide is split up.

Then there is the dissociation into electrically charged ions, positive K and negative CN, which is far more important. In an ordinary dilute solution more than 80% of the cyanide is split up; that is to say, for each 100 molecules of KCN added, less than 20 molecules of KCN remained as such, mixed with 80 ions of positive K and 80 ions of negative CN. The solvent power of KCN solutions depends, among other things, on the degree of concentration of the CN ions in the solution.

A similar thing occurs in the case of a dilute solution of ammonium cyanide. If an equivalent quantity of ammonium chloride is added to the KCN solution, a similar dissociation of the new salt occurs. The ions, positive NH_4 and negative CN, unite to a slight extent, forming NH_4CN and a similar small quantity of KCl is formed. The solution now contains minute quantities of KCN, NH_4CN, KCl and NH_4Cl, and relatively large numbers of the ions K, NH_4, CN and Cl, the first two being electro-positive and the last two electro-negative. The addition of KCl to NH_4CN gives identically the same result. The number of the ions of negative CN in those mixed solutions is appreciably the same as in the pure KCN or the pure NH_4CN solution, so that the solvent action of the solution is not perceptibly altered by the addition of the NH_4Cl. If that solution is evaporated, the volatile NH_4CN is driven off, and more is formed from its ions as fast as it is removed from the system, so that the whole of the cyanide can be removed in that way.

The answer to the question, "Which salts are in the solution?" is that none of them are in the solution as such; they are all ionized; if Messrs. Jarman and Brereton had considered that, they would have seen at once that the action of the different solutions they tried on strips of pure gold must be the same.

When one comes to treat ore and tailing the problem becomes more complicated. The protective action of ammonia depends on the number of ions of negative OH, but ammonia is slightly dissociated, and the number of ions would be comparatively small if it were not for the presence of the positive K ions. Potash is strongly dissociated; and, if KCN is present, the protective action might be regarded as being given by potash. It follows from this view that the destruction of cyanide by cyanicides would be greater in a solution containing ammonia and ammonium cyanide, than in one of potash and ammonium cyanide, or one of ammonia and potassium cyanide. That is a matter to be tested by experiment.

If one adds ammonium chloride to potassium cyanide, the dissociation of ammonium chloride is great, but it does not appear how ammonium chloride acts as a protective agent. Messrs. Jarman and Brereton find that it protects cyanide against the action of soluble sulphates; chloride of iron may be highly dissociated and more destructive to cyanides than hydrate of iron, but not so destructive to cyanides as sulphate of iron.

In treating cupriferous ores the matter became still more complicated, and the ionic theory at present is of little use, because not much is known concerning the ions of those complex salts. Messrs. Jarman and Brereton noted that 0.11% of ammonia is more advantageous than stronger solutions, at any rate when the percentage of copper is 1.5. Perhaps the advantage of a dilute solution of ammonia is to some extent connected with the reduction in the number of negative CN ions in the solution as the percentage of ammonia increases. As to Mr. Sulman's copper salts, his account is very convincing. The intense-blue color denotes the presence of the ion $Cu(NH_3)_4$, with two positive charges, sometimes called cupri-ammonium, which holds two ions of cyanogen in temporary alliance. The corresponding cupro-ammonium ion, positive $CuNH_3$, is colorless, and seems to form a large proportion of the green needle-like insoluble crystals of which Mr. Sulman spoke.

What is wanted is something to make

that exhausted solution useful again, or to prevent it from becoming exhausted; something to re-convert the cupro-ammonium into cupri-ammonium, or to prevent the reduction from taking place at all. One ought to be able to tell by the color of the solution how it is getting on from the point of view of its solvent power, and if something can be found to re-oxidize the cupro-ammonium base, or some oxidizer which will prevent the change from the cupri-ammonium into cupro-ammonium, the cyanogen might continue to be given off and a larger proportion made use of.

H. C. Jenkins said he would like to ask Mr. Sulman what were his views as to the mechanism by which the cupric-salt that he had in mind breaks down, and what was exactly in his mind when he spoke of 'nascent' cyanogen.

In reply, H. L. Sulman said that the word 'nascent' is a vulnerable one, because so often wrongly used. He would rather call that portion of the cyanogen held in the cupric-cyanide component which is available for solvent purposes 'potential' cyanogen, that is, something there to be drawn upon. He had pointed out that the ammonium cupric-cyanide compound is constantly 'breaking down,' or liberating half its cyanogen and becoming transformed into ammonium cuprous-cyanide; the blue solution of 'cuprammonic-cyanide,' when exposed to the air for a few days, gradually becomes decolorized into the colorless cupro-salt, the ionic constitution of which compounds Dr. Rose had so clearly shown. But gold can only combine with cyanogen at the actual moment of liberation. Cyanogen once liberated as a free molecule is useless for gold solution purposes. He was not responsible for the coining of the word 'nascent,' nor for the invention of 'ions.'

H. C. Jenkins said: "Do I understand that the author means the cyanogen ion when he speaks of nascent cyanogen? The ion which is liberated from simple cyanides as well as from other things? Because if he does, it seems to me that the solution of the gold would then run on all fours with the solution in the ordinary cyanide process."

H. L. Sulman said he certainly meant the same cyanogen ion; it is the same ion whether it combined with gold, potassium, ammonium, or copper. What he meant by stating that the reaction is a different type of cyanidation is that it is completely independent of oxygenation. It is cyanidation in which an oxygen ion does *not* take part.

Alfred James stated that Bertram Hunt was the founder of the process; at least, it is called by his name. He would mention one point which might illustrate the applicability of the process. It is very interesting chemically, of course, but Mr. Hunt personally has left working with copper ores and is dealing with ordinary gold ores. Then again, in Australia recently, when one of Mr. Hunt's colleagues had to tackle the question of cyaniding the cupriferous tailing there, in spite of the mass of chemical facts which has been accumulated with regard to the use of ammonia, he found it paid him best simply to dissolve out the copper by sulphuric acid, rather than attempt to use the ammonia, which, in spite of its protective action, does not seem to pay dividends.

The president said that the treatment of low-grade gold-copper ore is difficult. In a mine in Australia which would be known to many of the members (the Cobar-Chesney), there are large bodies of those ores, and a large amount of money had been spent, and a large plant put up, which failed owing to bad extraction. In treating such ores by crushing and concentration, claims are sometimes made that an extraction of 70%, or over, is being obtained, but the speaker believed it is actually considerably less. In the Cobar-Chesney mine above referred to, the dressing plant is now shut down, and the mine has been bought by a neighboring company having large smelting works (the Great Cobar Copper Company), which is mixing the ore with its own, and smelting them. This difficulty of utilizing low-grade copper ores is a trouble in many places, and any chemical process which can treat them has a great future.

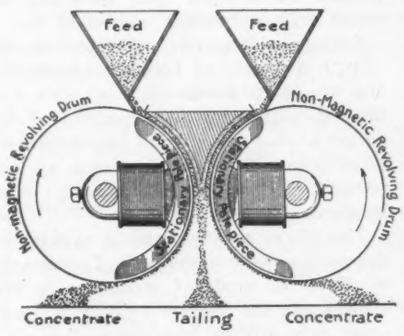
Aluminum-Steel.

In a recent number of the *Bulletin* of the Society for Encouragement of National Industry, of France, L. Guillet discusses the micrographic and mechanical properties of low- and high-tenor aluminum steel. The paper is illustrated with many photographs (reproduced in half-tone) of steel with low and mean carbon, and with aluminum from 0.5 to 15 per cent. The substance of the result is that the hardness is essentially modified by the presence of the clay metal; but the resistance to shock, while not altered by a small quantity, is seriously damaged by more than 1 per cent of aluminum. One prominent reason for this, developed microscopically, is that the pearlite becomes extremely compact from the presence of the aluminum, and no longer plays the rôle of a cement for the ferrite. The aluminum which is entrained in solution in the iron proper (ferrite) seems to harden the metal. The iron-aluminum solution does not dissolve the carbon, which result thus throws the pearlite into a granular form. It should also be recalled that steel with a low content of aluminum possesses a feeble hysteresis, which quality, therefore, suits it for certain phases of electrical work.

'White coal' is a nickname for the energy derived from water power; this 'catchy' expression is French in origin (*la houille blanche*). It has been in use in France for years.

A New Ore-Separator.

The Imperial ore-separator is a magnetic device for concentrating low-grade to high-grade material. Type B, a cut of which is given herewith, by its simplicity of construction and economy and efficiency of operation, commends itself to the consideration of those who are in any way concerned with the problem implied herein. As shown, the powdered ore is attracted toward the interior magnetic semi-circular poles, from which it is separated by the revolving non-magnetic drums. As soon as it is carried beyond the magnetic field, it falls off and to the side, and sufficiently removed from the tailing for separate mechanical manipulation by hopper, elevator or the like. This type of machine is especially suited for the treatment of ore carrying a strongly magnetic or magnetiferous ingredient. The inventor, R. R. Moffatt, is a practical mechanic, who has had some real experience with milling ore. A machine in operation



IMPERIAL ORE SEPARATOR.

can be seen at the factory at 45 York street, Brooklyn, near the end of the lower bridge from New York city.

A new method of soldering aluminum is announced by Chr. Sorensen, of Siagelse, Denmark. The surface of the metal is cleaned with hydrochloric (muriatic) acid, then covered with powdered potassium chloride which is carefully melted. The surfaces are then soldered by the use of metallic tin. It is stated that aluminum may thus be soldered to other metals also.

Messrs. Barrington & Holt write from Cartagena, Spain: "A development which is likely to have an important bearing on the industry of this district is the installation of a factory for the manufacture of sulphuric acid and mineral fertilizers. This factory is being pushed on with great activity and is expected to be working before the end of the year. Its annual consumption from the start is expected to be at least 30,000 tons of superphosphates, and 8,000 to 9,000 tons of blende and pyrite. This will probably be the means of employing a large quantity of poor blende high in sulphur, which at the present time is too poor to pay for export."

Prizes for Essays on Lead Poisoning.

The Internationales Arbeitsamt, in Basel, Switzerland, has offered the following prizes for essays on means of combating lead poisoning:

1. A prize of 5,000 marks ($1,190) for the best essay upon the most practical method of eliminating the danger of lead poisoning during the process of handling lead ores.

2. A prize of 10,000 marks ($2,380) for the best essay upon the elimination of the danger of lead poisoning in lead-smelting works.

3. Two prizes, one of 2,500 marks ($595) and a second of 1,500 marks ($357), for the best essays upon the elimination of the danger of poisoning in chemical and electrical works where lead is in use.

4. Four prizes, one of 1,500 marks ($357), a second of 1,000 marks ($238), and two of 750 marks ($178.50) each, for the best essays upon the most practical method of avoiding lead poisoning in trades such as painting, enameling, etc.

5. Four prizes, one of 1,500 marks ($357), a second of 1,000 marks ($238), and two of 750 marks ($178.50) each, for the best essays upon the elimination of the danger of lead poisoning in factories where large quantities of lead are used, as, for instance, in type foundries, printing establishments, etc.

The essays must contain a systematic description of the source of lead poisoning, in which the mode of production is described and the dangers existing in each stage of the process, in transportation, etc., are mentioned. Other causes of lead poisoning are also to be given, as, for example, working too long at a certain process, uncleanliness, insufficient knowledge on the part of the workmen, bad or insufficient food, irrational mode of living, and unhealthy apartments.

The proposals made must give the possibility of elimination of the danger in such a manner that no objection can be made on technical, hygienic, or economic grounds. The dangers are to be given, so far as possible, in classes, in order to make it clear at what stage of the process or under what conditions there is greatest and least danger.

In proposals for new apparatus or alterations in process, the cost and saving involved in such proposals must be given. It is preferable that the essays contain proposals for improving the existing laws upon this subject in all States, and the alterations in legislation which would be necessary to carry out the proposals. They could also contain copies of proposed instructions to be posted in factories for the guidance of the workmen. Works containing existing laws on this point can be found in most important public libraries.

Papers may be written in English, French or German. Printed books will not be admitted. The completed manuscript must simply bear a title on the cover. The name of the author is to be inclosed in a sealed envelope which bears the title of the essay. The essays must reach the Internationales Arbeitsamt in Basel by December 31, 1905. The Internationales Arbeitsamt will have the right to publish the prize essays, although the author retains the right of literary ownership. Articles not published will be returned to the authors.

All communications must be addressed to "Das Internationales Arbeitsamt, Basel, Switzerland," and should be sent by registered mail.

A Hospital on Wheels.

SPECIAL CORRESPONDENCE.

The Lackawanna Coal Company has built a hospital car, furnished with the latest surgical equipment and has attached to its service a doctor and his assistant. The car made its first professional trip last week, when a miner who was injured at the Woodward colliery was taken to the Moses Taylor hospital in Scranton, the journey being performed with success. During the trip the man's injuries were professionally attended to by Dr. Lake, the car-surgeon, so that when he arrived in Scranton there was nothing to do but to remove the patient to his cot in the ward. Being so promptly attended to, the man suffered comparatively little pain.

The hospital car of the Lackawanna is the only one in the anthracite regions, but it is not likely to remain long an exception, as the other railroad companies who own mines will probably follow suit. A hospital car for the coal mines is a necessity. Many of the mines are long distances from a hospital, while they are all situated on, or near, railway tracks, where a hospital car can be conveyed without delay or inconvenience.

Under the new conditions the patient can be treated in the hospital car, regardless of the nature of the accident. Should it be necessary, as it often is, that amputation should be performed, the car carries all the equipment that its surgeon may need in such an emergency. This is the first time the car has been used since it left the builders' hands, some few months ago. It has not, however, been idle during all that time. It has gone the rounds of the Lackawanna mines, visiting each colliery, where Dr. Lake has given personal instruction to many miners and mine attendants on first aid to the injured. Miners are intrepid in rescue work, but it is all important that someone about the mines should be able to give first aid to some poor fellow 'badly smashed,' as they say, before the ambulance doctor arrives upon the scene. The car will be taken periodically from mine to mine for instruction work, performing the double function of hospital and school.

Commercial yttria is chiefly obtained from the minerals gadolinite and yttrialite.

Correspondence.

We invite correspondence upon matters of interest to the industries of mining and metallurgy. Communications should invariably be accompanied with the name and address of the writer. Initials only will be published when so requested.

Letters should be addressed to the Editor.

We do not hold ourselves responsible for the opinions expressed by correspondents.

Cinder Cement or Concrete.

Sir—In your issue of June 1, page 1038, there was an article on 'Cinder Cement,' from the reading of which I understand it to apply to coal cinder, or ash, concrete, and in that light I fully concur in your stricture that it "is a humbug and a danger, without one redeeming feature."

The term cinder cement is not only ambiguous as applied to this material, but is likely to be misleading, inasmuch as furnace slag is frequently termed cinder, and from that a cement is made of which Dr. Tetmayer says, "I consider slag cement a binding material of par excellence." Moreover, furnace slag, when air-cooled, is extensively used as an aggregate in concrete and, when granulated, is used in the matrix in place of common sand; for some purposes producing a concrete superior to that made from the ordinary materials.

JOS. A. SHINN.

Pittsburg, June 15, 1905.

Cement and Concrete.

Sir—On looking over the issue of the JOURNAL for June 1, I was attracted by an article treating on cinder cement. I read it through thinking it was describing some new cement, but found to my surprise that you were talking about cinder concrete—something different from cement. Still I was not certain until I read the little item beneath about reinforced cement.

Concrete is composed of sand, stone and cement, and the cement may be from 4 to 11% of the mass. Why does a great technical paper like yours refer to concrete as cement the same as the rural papers do? No user of concrete refers to it as cement, and no one at all posted in its use calls it cement. Cement is simply one of the ingredients and the one that cements together the aggregates composing the mass, whether they be sand, stone, gravel, cinders, etc.

A paper with the standing of yours should be more careful in discussing technical matters and especially processes so universally used that the terminology is fairly well settled. The only subject of dispute now is whether we shall say concrete steel, steel-concrete, armored concrete, or reinforced concrete, when speaking of concrete and steel in combination. Usage in America seems to be rapidly tending towards the term reinforced concrete.

ERNEST MCCULLOUGH.

Chicago, June 9, 1905.